MECHANICAL HANDLING

INCORPORATING 'MATERIALS HANDLING'

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MATERIALS HANDLING AFFECTS ALL WALKS OF LIFE

WE RECENTLY received an enquiry from a doctor at a well-known London hospital for information as to the possible installation of a conveyor for handling X-ray plates from the diagnosticians' room to a library where they are stored for future reference. This has, of course, been done before, and we have published articles describing the use of tractors and trolleys in hospitals for taking food from ward to ward.

In an early issue we are publishing a picture showing how an overhead hoist, erected over a patient's bed, can be used to sit him or her up in bed, thus saving not only the patient, but the nurses, considerable effort.

Not long ago these pages contained details of how a well-known firm of City bankers used a fork truck for handling bullion at their head office. Banks and large insurance companies have, of course, for some time used machines for sorting money and hand trucks of various shapes and sizes for dealing with the large ledgers and other account books which they use.

Many types of men's and women's clothes are produced with the aid of conveyors. The modern laundry and dry cleaners are large users of mechanical handling equipment. The layman often thinks, if he ponders the subject at all, that mechanical handling equipment is used only in large mass-producing concerns, such as motor car manufacturers, and breweries. Nothing could be further from the truth.

To-day even the smallest farm is mechanized to enable us to get better food at an economical price. The small dairies fill their bottles by machinery and the milkman has the filled bottles in unit loads which are easy to handle and refill with the empty bottles. Slightly different from years ago when the milkman trudged from cart to door with a heavy can.

Bread, cereals, tinned food, clothing, footwear, furniture, carpets and linoleum, are all, to-day, produced with the aid of mechanical handling equipment. After they are manufactured, with the aid of materials handling methods, they are moved to store, or to await despatch to the distributing point.

Almost everything we use to-day reaches us with the aid of, or through, mechanical handling equipment and materials handling methods. How important it is, therefore, that our handling methods should be continually under observation to see if they are really up to date, or if they can be improved.

SEVENTH MECHANICAL HANDLING EXHIBITION - 1960

The Seventh Mechanical Handling Exhibition (organized by this journal) will be held next year at Earls Court, London, from Tuesday, May 3rd, until Friday, May 13th. Make a note.

Pour les lecteurs de l'étranger
Für unsere ausländischen Leser
Para los lectores de ultramar

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For readers overseas

SOMMAIRE EN FRANÇAIS

INHALTSÜBERSICHT AUF DEUTSCH

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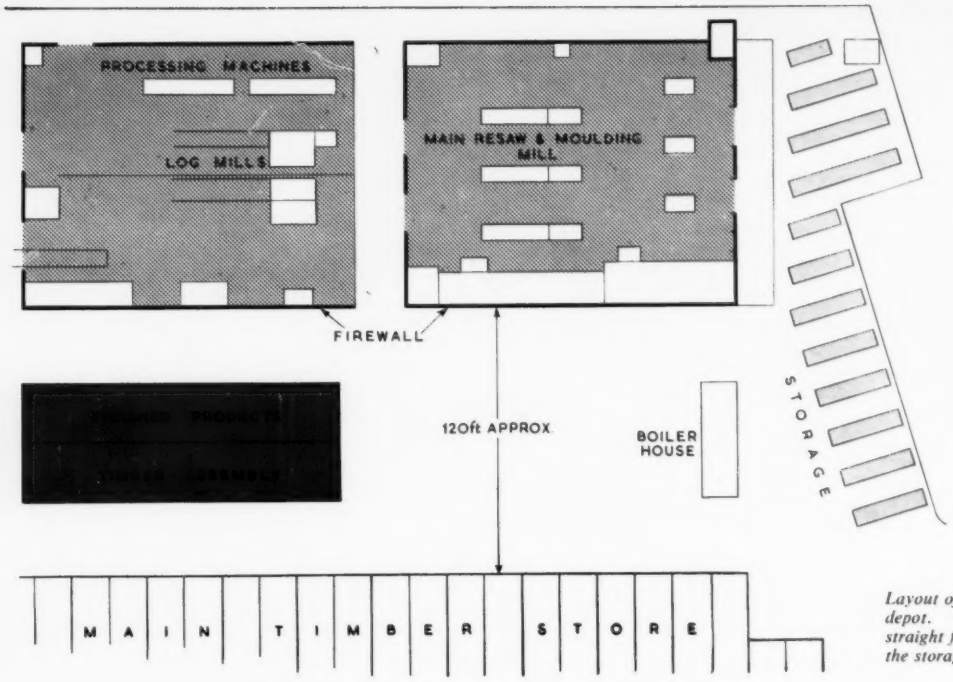


Layout of Montague Meyer's Millwall depot. Fire regulations prevent a straight flow of traffic to the mill from the storage sheds

SIDE-LOADERS IN A TIMBER MILL

At the Millwall timber yard of Montague L. Meyer, Ltd., two side-loading fork lift carriers, working on the wharf and in the storage areas, loading vehicles, and feeding the machines in the mill, handle a throughput of 75,000 tons a year.

MONTAGUE L. MEYER, LTD., are one of the leading importers of timber and timber products in the United Kingdom. In 1936 they obtained, on a long lease from the Port of London Authority, an area of approximately 10 acres on which they erected large timber storage sheds and a sawmill capable of almost every operation within the scope of a modern mill.

The timber storage yard comprises 1,000 ft of river frontage where there is a constant depth of water. Running at right-angles from this frontage are nine shed-bays each 60 ft wide and 550 ft long, and in each bay is a high-speed, overhead gantry crane. The result is a vast, 6-acre shed in which Montague Meyer can store in the dry about 10,000 standards ($1\frac{1}{2}$ million cu. ft.). In this ideal environment the condition of the timber improves whilst in storage. Because of the degree of mechanization employed, it can be delivered with the minimum of delay to customers' vehicles.

So large a concentration of timber creates a possible fire hazard and because of this the London Fire Office insisted that the sawmill had to be a separate building. The separation of a sawmill from the main storage yard caused a handling difficulty which, until a few years ago, was solved by using small timber bogies pulled by either electric or petrol tugs.

The disadvantages of this system will be apparent when it is realized that the normal intake of the sawmill is 15,000 tons a year, and each unit of intake has to be handled four to five times. This meant that Montague Meyer had to bring into use some 100-200 small timber trailers and four powered tugs, which resulted in a cumbersome, unwieldy organization. This whole operation is now handled by two side-loaders.

A recutting sawmill attached to a timber importer's yard has, of necessity, to be a servant of the timber importer's

The mill as it was in the days of the trailers. With less machinery and a smaller throughput, it was more congested than it is to-day

Lancer side-loader at work in one of the storage sheds where 10,000 *standards of softwood can be housed under cover*

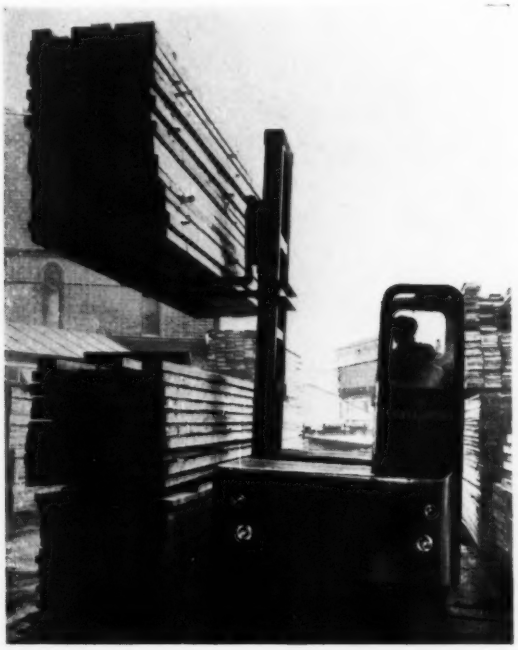
sales organization and must undertake cutting or planing to the customer's requirements. This situation results in a great variety of work, on orders ranging from small tiling battens to the large baulks used for dock work or sea defences. The quantities for each job vary tremendously and the whole success or failure of the sawmill rests upon its flexibility.

Montague Meyer's principal machines are three Robinson band resaws, two 54-in models and one 60-in. These serve and are followed by a battery of modern moulding and planing machines. There are also many minor machines such as straight-line edgers, hydraulic crosscuts, spindles, and routers. By being thus fully equipped with modern machinery, this sawmill can meet its customers' varied and often urgent requirements.

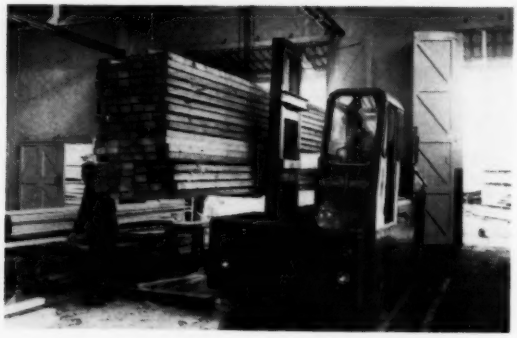
Montague Meyer had always been conscious of the difficulties involved in handling bulky timber of varying sizes, and when the Millwall sawmill was built in 1936 the company had the foresight to erect a building with no vertical obstructions, having a clear span of 120 ft. The introduction of the side-loader seemed the answer to a great many of their problems, for a state of congestion had been reached as the turnover of the sawmill increased in post-war years. Two German Irion side-loaders were bought, and it soon became apparent that side-loaders were going to resolve their difficulties.

RIGHT AND BELOW

Picking up a load for machining. Our pictures show the sequence of movements in the first stage of a typical operational cycle performed by the side-loader serving the mill



Second stage in the work cycle: the load is carried from storage area to mill



Third stage in the work cycle: feeding material to a machine

Load of timber being picked up by the side-loader after completion of a processing operation

In the early stages these side-loaders were hampered in their task of supplying the machines with wood because of the presence in the sawmill of trailers—loaded, semi-loaded and empty. A decision was therefore made that a compromise between the system of trailers and side-loaders was impossible, and overnight the trailers disappeared.

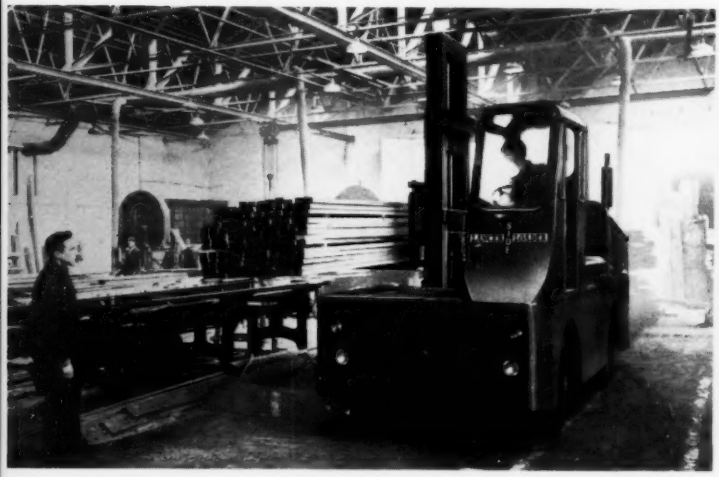
The result, after a certain number of teething troubles, was almost magical. The floorspace of the mill became clear and seemed to have greatly increased. The machinists welcomed the new system because they no longer had to stop work and help labourers manhandle the heavy and unwieldy trailers. They also enjoyed the convenience of having the wood nearer their machines and close to hand. Production increased and economies were effected.

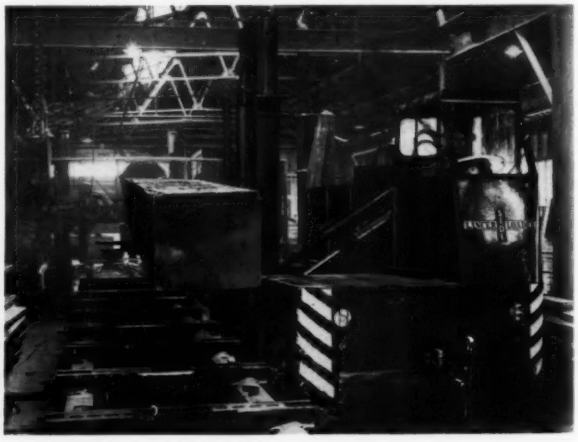
The two machines, however, were hard put to cope with the volume of throughput, and, after about 18 months of valiant service, were replaced by two Dutch-manufactured Lancer-Hendre side-loaders with British Ford engines and components. By now the technique of using side-loaders had reached a peak of efficiency and their use was thoroughly understood by management, machinists and labourers. The results were most satisfactory, and again the throughput increased. Recently one of the Dutch Hendre machines has been replaced by the new British-built Lancer 'Side-loader' which was demonstrated to the Press and reported in the April issue of *Mechanical Handling*. Since then another has been acquired, and there are now two of these machines in operation at Millwall.

To-day two side-loaders are doing the work of 100-200 trailer-handcarts and four tugs, and performing the additional function of picking up and putting down their own loads. The annual intake can be assessed at 15,000 tons, but each unit of intake is handled at least four times. First, it is taken from the main storage yard to a service pool outside the sawmill. From the pool it goes to the resawing or moulding machine. After resawing or moulding it is transferred to a delivery pool, and, finally, it is loaded on to a vehicle for despatch. It is estimated, however, that 50 per cent of the timber processed in Montague Meyer's sawmill goes to more than one machine. Therefore, it is correct to say that the pair of side-loaders in their Millwall mill handle some 75,000 tons of timber a year.

BELOW LEFT
Transfer of work in process to a second machine. High ground-clearance allows the body of the truck to be brought over a bolster and the timber is placed precisely in the position most convenient to the operator of the wood-working machine

BELOW
Narrow aisles do not restrict the performance of the side-loading fork lift transporter





A TWO-TON REACH TRUCK

Fig. 1. Lansing Bagnall's new reach truck with 16-ft mast in their works at Basingstoke

Lansing Bagnall's new 2-ton FRER 245 has been developed from the 1-ton machine exhibited at the 1956 Mechanical Handling Exhibition as the first reach truck to be introduced into Great Britain. This report is a sequel to the one that appeared in the July, 1956 issue of 'Mechanical Handling', which affords the basis for a comparison of the two models. An account of observations made in a sawmill and engineering works shows the extent to which the function of the reach truck has been expanded

SINCE the first reach truck was introduced by Lansing Bagnall, Ltd., at the fifth Mechanical Handling Exhibition in 1956, several other trucks in this class have appeared on the market—some of British manufacture and others imported. The Lansing Bagnall reach truck has grown steadily in popularity, and machines based on the original 1-ton model described in a technical report in the August, 1956 issue of *Mechanical Handling* are now seen everywhere. There is no doubt that the demand will continue to grow, for the machine has the virtue of being able to work in remarkably narrow aisle-widths, and is in many ways the ideal warehouse truck.

With the introduction of a 2-ton model, an entry has been made into a new field, and the truck itself has aquired new characteristics. It is more robust and also more generous in all its proportions, enabling the driver to sit instead of standing at his work. With cushion or 'Duthane' tyres on all four wheels, it is capable of riding on rougher ground without discomfort or loss of stability. The chassis is of heavier section and the reach mechanism has an extended bearing on the chassis. The chassis is articulated to a greater degree. The mast can be tilted.

Structural rigidity has been increased by the use of heavier sections and larger bearing surfaces. Other improvements can be discerned in the detail design of many of the parts. As many parts as possible are interchangeable between the old and new reach trucks, and between the reach trucks and other machines in the L.B. range. Compactness has been maintained by ingenuity and good design. To cite a rather obvious example, the hydraulic fluid tank is contained in space that might well have been wasted inside one of the straddle legs.

Attention has obviously been paid by the designer to the all-important question of maintenance. Among the points that emerge from the specification are the accessibility of the axle pivot by which the chassis is articulated, the ease with which the stabilizer can be adjusted and the slack taken up on the steering chain, and the provision that has been made for removal of the two-piece battery for charging by the attachment of a relatively inexpensive jib.

Reach trucks are now too well known to call for an explanation of their operating principles. Any reader unfamiliar with them is referred to the article appearing in the July 1956 issue of *Mechanical Handling*, which serves also as a basis for comparison of the original 1-ton version with the new 2-ton model as described in the specification data that follow.

Principal Specification Features

Dimensional data and space requirements, performance data, capacity ratings, and floor-loading figures, are given in Figs. 17, 18, 19, 20 and Table 1. They are supplemented below by notes on the more important details of the specification for the FRER 2. Many of the design features are illustrated by photographs (Figs. 3, 4, 5, 6 and 7) taken while the machine was being built.

Chassis: The chassis (Fig. 3) is composed of two integrally built parts, one of which protects the drive-unit hydraulic system and control gear and is extended upward to form the driver's cabin, while the other supports the load-wheels and provides the runways for the reach mechanism. The power-unit chassis is constructed of electrically welded $\frac{1}{2}$-in-thick steel plate.

A 4 × 4-in steel cross-member strengthens the junction between the reach straddle legs and the power-unit chassis, making the complete assembly a one-piece rugged unit. Channel section $5\frac{3}{4} \times 2\frac{3}{16}$-in cold-drawn steel members are machined to form the guides, and are reinforced with $\frac{5}{16}$-in steel plate to form a tough and robust box-section structure. The right-hand reach leg is partitioned internally to provide a built-in hydraulic reservoir of 5-gal capacity.

Wheels and Tyres: Load wheels are mounted in ball bearings on cantilevered stub axles welded to the channel sections at the end of the straddle legs. Tyres may be 12 in dia × $6\frac{1}{2}$-in cushion rubber, or 12 in dia × $5\frac{1}{4}$-in 'Duthane'.

The drive wheel is spigoted to the shaft, and retained by six spherical-seated wheelnuts. The 12 in dia × $5\frac{1}{2}$-in cushion tyre is bonded to the wheel centre. Each of the 8 in × $3\frac{1}{2}$-in castor wheels is mounted in ball bearings on a stub axle. The drive unit and twin-castor balancing wheels are mounted on a large casting that forms the axle beam.

Power Unit: Power for the travelling motion is supplied by a compound-wound electric motor, designed, built, and tested, in accordance with B.S. 1727. It has two field windings—one shunt and one series. The accelerator pedal actuates a multi-step controller which, through the action of a number of contacts, switches various resistances into and out of circuit. The circuit is of the controlled compound type, under which the shunt winding of the drive-motor field is used for all normal running purposes—including starting, acceleration, and braking. When a heavy overload is imposed, a contactor trips in at a predetermined current level and introduces the series field windings. The nominal $\frac{1}{4}$ hr rating is 3·8 b.h.p. and the speed range is from 0 to 4,000 r.p.m.

Battery: Current is stored in a 24-V Exide 'Ironclad' lead-acid battery, type MTX11, of 550 Ah capacity at the 6 hr rating. It is divided into two separate units of six cells each, packed in L-shaped steel containers and mounted at either side of the mast behind the driver's compartment. Positive location is provided by studs projecting from the bottoms of the cases and engaging holes in the chassis.

At 20 kWh, the charging rate for the FRER 2 demands a current supply in excess of the 15 Ah capacity of the normal type of power point, and a wall-mounted charger is required. Connection from battery to charger is made by separating the plug and socket under the driver's seat and plugging the charger lead into the battery side of the connection. This automatically isolates the traction circuit and makes it impossible for the truck to be driven away whilst on charge.

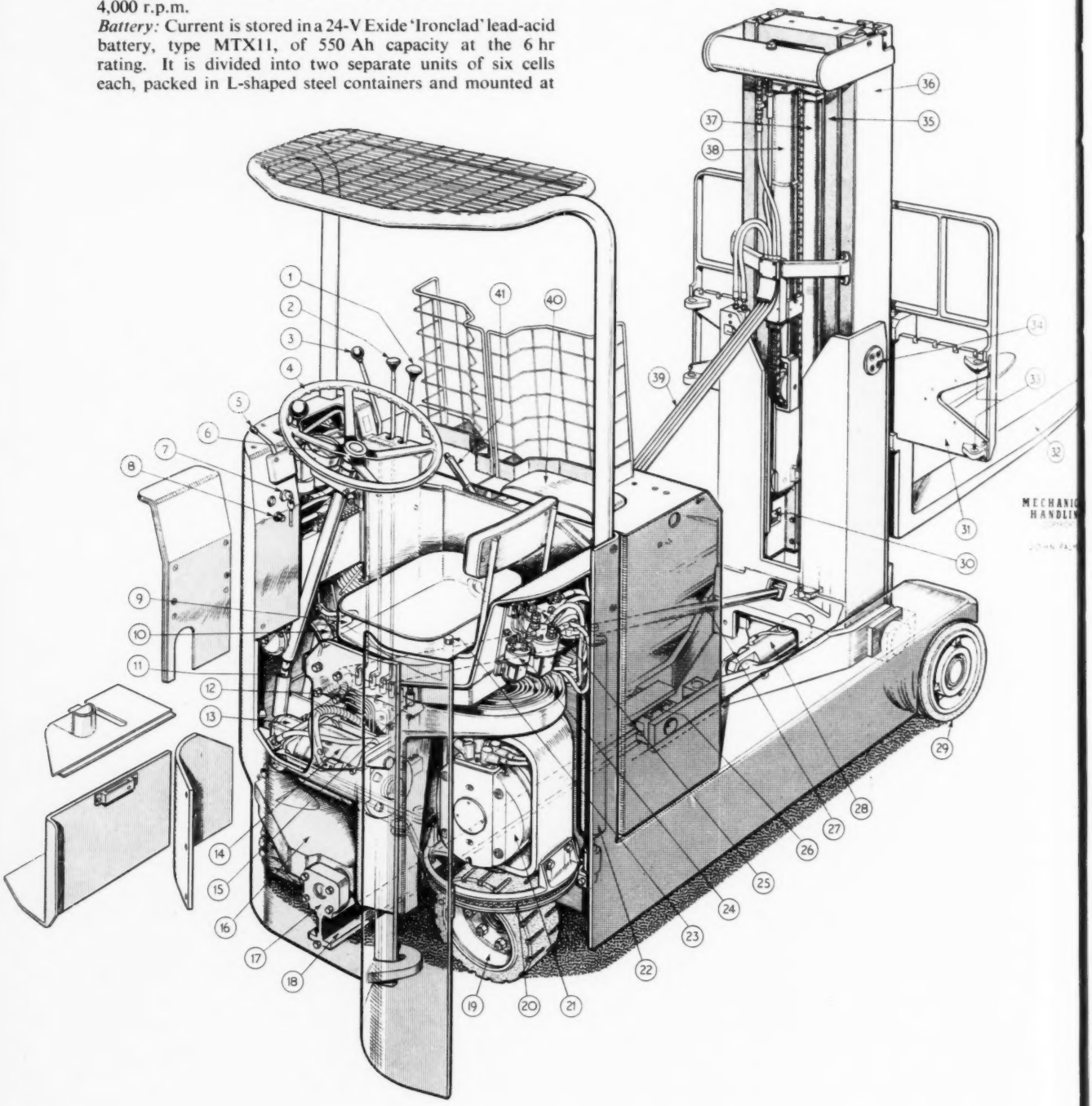
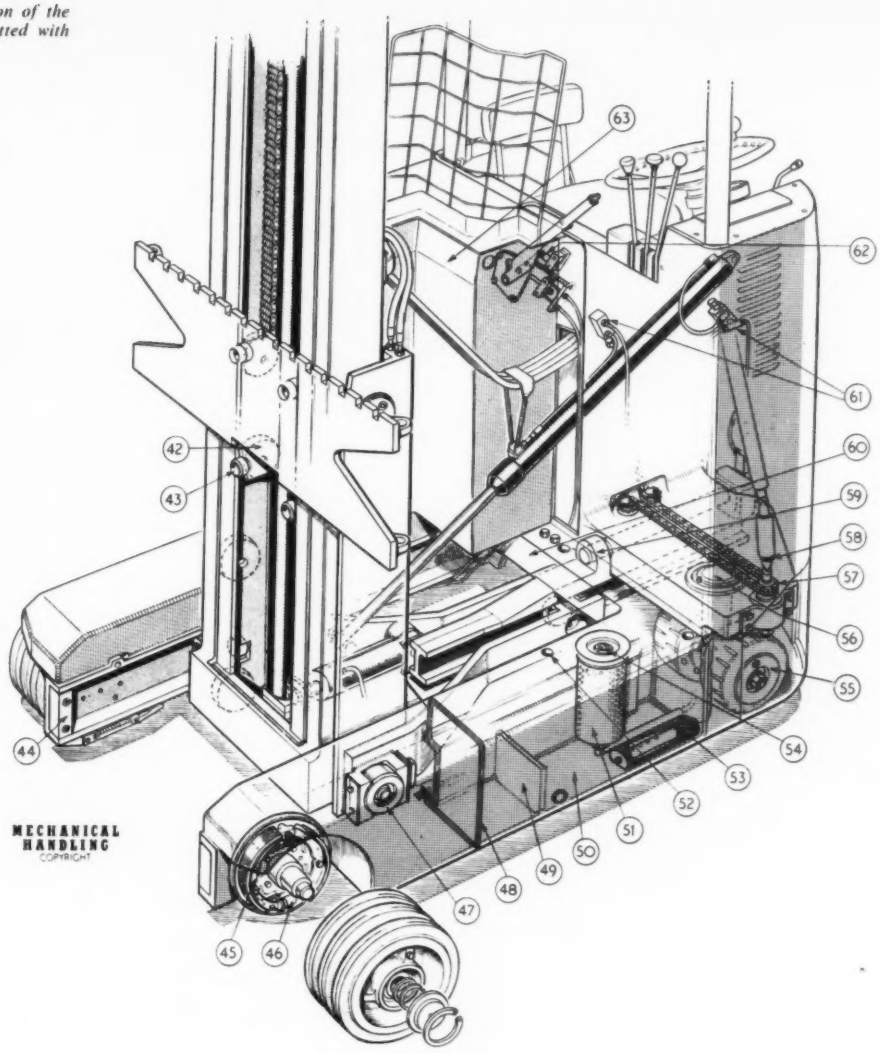


Fig. 2. Our artist's representation of the 2-ton reach truck FRER 245, fitted with 'Duthane'



KEY

1 Tilt lever
2 Reach lever
3 Lift lever
4 Steering wheel (16 in dia)
5 Forward-reverse lever
6 Steering indicator
7 Switch key
8 Horn push button
9 Accelerator pedal
10 Hydraulic brake pedal
11 Universal jointed steering column
12 Hydraulic control valve bank
13 Hydraulic gear pump
14 Hydraulic pump motor—8 b.h.p. intermittent rating
15 Relief valve—hydraulic pump
16 Axle beam
17 Axle front trunnion
18 Central reach guide channel
19 12-in dia cushion-tyred drive wheel
20 Steering chain. Duplex roller
21 Compound wound drive motor
22 Coil spring stabilizer
23 Seat-operated master switch
24 Electrical control gear for pump motor
25 Battery-circuit connector (behind)
26 Reach guide roller
27 Reach jack
28 Tilt jack
29 12-in dia 'Duthane' tyred load wheel
30 Adjustable side roller
31 Fork carriage
32 Fork
33 Battery removal attachment lugs
34 Mast pivot
35 Inner mast
36 Outer mast
37 Main lift jack
38 Free lift jack
39 Multi-core high-pressure hose
40 Driver's arm rest
41 Handbrake lever
42 Fork carriage guide roller
43 Fork carriage side steady roller
44 Mast reach travel safety stop
45 Load wheel brake assembly
46 Hydraulic actuating cylinder
47 Reach guide roller
48 Chassis frame section, $\frac{1}{16}$-in steel plate
49 Hydraulic fluid tank baffle
50 Built-in hydraulic fluid tank
51 Renewable element filter
52 Battery locating holes
53 Mesh filter—suction line
54 Hydraulic fluid filler cap
55 8-in dia cushion-tyred twin castor
56 Castor swivel bearings
57 Steering chain adjustment
58 Steering shaft splined end
59 Axle rear trunnion
60 Heavy main cross member
61 Reach travel decelerating valves
62 Handbrake interlock switch
63 Two-section battery

The battery removal attachment seen in Fig. 4, can be supplied as an optional extra, it consists of a swinging jib that fits into sockets on the side of the fork carriage. A spreader-bar at the end of the jib keeps the battery upright when the carriage is raised and the jib is swung out over the side of the truck and lowered on to the floor or charging platform. The cable plugged into the circuit when the battery is disconnected is long enough to allow the cells to be charged at a distance from the truck.

The traction motor drives through reduction gearing to a single drive-wheel (Fig. 5). The motor is carried horizontally in a housing at the top of a malleable cast-iron casing which encloses a train of gears. The motor pinion and its mating wheel are helical gears; straight spur gears are used for the remainder of the train, providing a total reduction of 28·8:1. The assembly runs in an oil bath.

Steering and Suspension: Steering is on the drive wheel, which, with the twin-castor balancing assembly, is supported by a large and robust casting (Fig. 6).

The gearbox is mounted on two heavy-duty bearings, a ball journal at the top and a roller journal at the bottom, and these enable the entire drive unit to rotate within the axle beam.

The castor assembly is supported at the right-hand side of the beam on either side of a trunnion carried from a central turntable shaft. A lever-arm extending vertically upwards from the trunnion, and fitting loosely over a peg projecting from the vertical shaft, acts as a stop to limit the articulation of the castors. The vertical shaft is supported in the axle beam on adjustable tapered roller bearings and the complete castor assembly can rotate freely through 360 deg.

Articulation is obtained by the vertical movement of the axle beam about a central pivot. This vertical movement is

controlled by a stabilizer comprising an outer steel tube, a heavy coil spring, and an inner plunger which will compress the spring in either direction. A movement of approximately 1 in at the stabilizer allows $\frac{5}{8}$ in deflection at the road wheels. By adjusting the central plunger in relation to the outer cylinder, the axle beam can be repositioned to take up any misalignment resulting from wear on the drive wheel or castor tyres.

A cast-steel member performs the dual function of a pivot for the axle beam and a guide track for the rear rollers of the reach mechanism. Steering action is transmitted by direct chain drive from a sprocket at the base of the steering column to a ring on the drive unit.

Two idlers mounted on the axle beam maintain an adequate wrap-round, and adjustment is obtained by means of an eccentric boss at the base of the steering column. Vertical movement of the pinion due to the articulation of the axle beam is absorbed by a splined joint at the end of the shaft.

Braking: Braking is effected by a combination of electrical, hydraulic, and mechanical systems. Electrical braking is applied automatically whenever the machine tends to drive the motor. Regenerative braking operates at the upper end of the speed range, the energy absorbed by the motor, acting as a dynamo, being returned to the battery. At lower speeds dynamic braking takes over, and the energy is absorbed by a rheostat.

Girling 8 × $1\frac{1}{4}$-in hydraulic internal expanding brakes, with cable linkage to the handbrake, operate on the load wheels. The efficiency of the electrical braking system tends to limit their use to emergency situations, but they are there when the need arises. Application of either the footbrake or the handbrake operates microswitches that cut the traction circuit. There is no device to render the handbrake microswitch inoperative when starting on a gradient.

Fig. 3. Chassis of reach truck. This is an integral structure mainly of $\frac{1}{4}$-in steel

Mast Assembly: The main members of the mast assembly are formed of $5\frac{3}{4}$ in × $2\frac{3}{16}$-in bright cold-drawn steel channels. The inner mast runs on widely spaced steel guide-rollers mounted on ball bearings. Adjustable side-facing rollers are fitted to take lateral thrusts. The outer mast is supported in a fabricated steel frame, which also forms the carriage for the reach travel. The mast pivots in 'Ferobestos' bushes at the top of the main frame, the base of which carries the tilt jack that acts on the base of the mast. The telescopic lift follows the standard Lansing Bagnall system.

Fig. 4. Removing one of the battery cells for charging
(a) the spreader bar on the jib attachment is fastened and the long lead connected
(b) with the lever operating the hoist motion, the jib is lowered until the battery rests on the floor (or charging table)

4a

4b

Fig. 5. Drive unit for FRER. This is the standard type of assembly used on Lansing Bagnall electric trucks

The carriage is fabricated from $\frac{7}{8}$-in thick steel plate. The guide-rollers are identical with those carrying the inner mast. Side-rollers are mounted on the webs that carry the guide-rollers. Forks of forged steel, 5 × $1\frac{3}{4}$ in section, and 40-in standard length, are secured to the parallel faces of the $\frac{7}{8}$-in carriage plate by claw-type retainers, located by slots in the top face of the carriage and retained by pins. Extra-wide carriages are available of $1\frac{1}{4}$ in thickness, with top and bottom edges machined to $\frac{7}{8}$ in to fit standard forks.

A single plate-link chain raises the fork carriage. With an ultimate breaking load of 32,000 lb, and a maximum working load of 4,800 lb, it has a safety factor of approximately 6·5:1—a generous margin over the normal proof-test factor of twice the working load required under the Factory Acts.

The complete mast assembly is carried on a framework that travels on steel ball-bearing-mounted rollers running in the chassis guides (Fig. 7). A roller at either side at the mast end of the frame travels in the guide-channels formed in the straddle legs, and two inward-facing rollers at the opposite end of the reach carriage run in guides machined in the cast-steel axle pivot bracket. Movement of the mast is controlled by a double-acting hydraulic jack, which is connected at an angle between the bottom of the mast and the upper front end of the power-unit chassis. A simple single-stage jack is used.

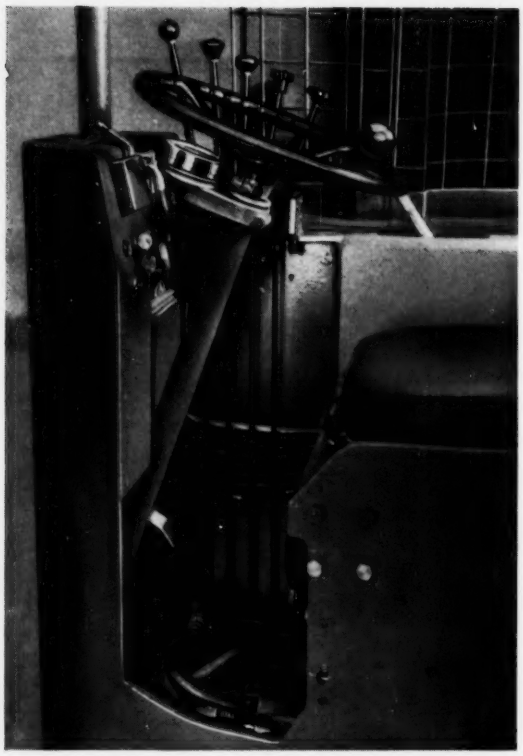
Hydraulics: Power for the hydraulic system is supplied by a Plessey gear pump driven by a two-speed compound-wound electric motor. This unit is mounted immediately under the driver's floorplate on a pivot that enables it to be swung upward for inspection (Fig. 8).

The hydraulic system is controlled through a bank of valves located under the floorplate. Normally the truck uses only the lift, reach, and tilt valves, leaving the remaining two available for attachments.

ABOVE
Fig. 6. The massive rear axle beam, with stabilizer in position. The swivel ball-bearing mounting of the twin castor wheels can be seen clearly

Fig. 7. View looking down between straddle legs on the reach mechanism and hydraulic ram

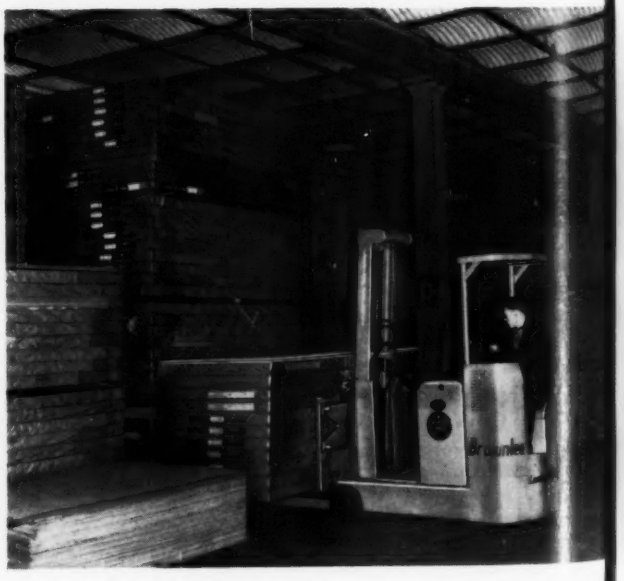
BELOW
Fig. 8. Operator demonstrates accessibility of the pump-motor unit



LEFT
Fig. 9. The driver sits sideways in the cabin of the new reach truck. Th five-slice bank of control valves is shown connected by steel rods to a fu complement of hydraulic levers

BELOW
Fig. 10. The trailer seen being loaded for despatch against a backgrou of teak can receive a full 8-ton payload in four 2 ton lifts

Fig. 11. Stacking 8 × 4-ft crates of plywood in the warehouse o Brownlee & Co., Ltd., Port Dundas, Glasgow



Movement of any one of the control levers actuates a microswitch and starts up the pump motor. In the case of the lift system, the initial movement of the lever starts the motor at the slow rate, and continued movement switches in the faster rate by cutting out the shunt field, thus enabling the lift speed to be regulated through a wide range without perceptible change in the acceleration rate when the motor speed is increased. The slow speed is used for tilting and reaching back. When reaching out, the fast rate is used. This maintains an approximately constant speed in both directions, since the volume of oil is greater at the back of the piston than at the front.

An overload-relief valve incorporated in the control-valve assembly is set at 2,400 p.s.i. A bank of five recuperator and relief valves is connected in the system. The relief valves are set at 3,000 p.s.i. and their function is to protect the hydraulic jacks from shock loads. The double-acting tilt and reach jacks each have two relief valves: the lift jack has one relief valve. The recuperator valves release oil into the jacks to prevent the formation of a vacuum following the operation of a relief valve.

The reach speed is reduced at each end of its travel through the action of valves. These are so arranged that the angular movement of the reach jack causes a plunger to be depressed and operates the valve controlling the appropriate direction of travel. A relief valve set at 1,500 p.s.i. prevents an excessive build-up of pressure in the annulus when the slow-flow valve is operating at the end of the outward reach.

All hydraulic cylinders are of drawn-steel tube with honed bores. The lift jack is fitted with fluon seals and nylon bearings. Reach and tilt jacks are fitted with fabric-backed rubber seals effective at all pressures from 0 to 10,000 p.s.i. The 5-gal reservoir is fitted with a micronic

Fig. 12. Chipboard from the Scottish factory of The Airscrew Co. & Jicwood, Ltd., is handled in 33 cwt loads

Fig. 13. FRER brings a set of West African mahogany to the drying kilns

ABOVE
Fig. 14. Manœuvring in the restricted space available in the bearing shop at James Howden's main works, the reach truck feeds the machine tools with work in progress

RIGHT
Fig. 15. Empty pallets are stacked in the yard adjacent to the bearing shop, ready for immediate use

filter with a replaceable element, and a mesh filter is fitted to the suction line from tank to pump. Working oil pressures in various parts of the system are from 700 p.s.i. to 2,200 p.s.i.

Driver's Controls: The operator sits sideways across the truck and enjoys good visibility when travelling backward or forward, stacking, and manœuvring. Driving controls follow normal industrial truck and automotive practice, with foot-operated accelerator and brake pedals, hand-operated parking brake lever, and 16-in dia steering wheel. Hydraulic control levers are grouped alongside the steering wheel and connected to the bank of valves directly beneath (Fig. 9).

The remaining controls are a key switch, reversing switch, and horn pushbutton.

Various safety features are incorporated. The electrical circuit is controlled by a switch under the driving seat which makes contact only when the driver is properly seated. The time needed to energise the starting contacts makes it impossible to start the vehicle at a high speed by pressing the accelerator pedal down quickly. The driver is protected by an overhead guard of heavy-gauge steel tube and wire mesh and an additional shield between him and the mast assembly.

Attachments and Standard Alternatives: Various alternative types of fork masts, fork carriages, and battery chargers, can be fitted to the FRER 2. Crane or ram attachments can be fitted in place of forks, and there is also a useful load clamp fitted with a pressure-control valve that enables the strength of the squeeze to be related to the resistance of the load. Extras include the Lansing Bagnall load-capacity indicator (which one sometimes feels should be made compulsory), tilt indicator, and steering indicator. Also a state-of-charge meter, sidelights, and spotlight.

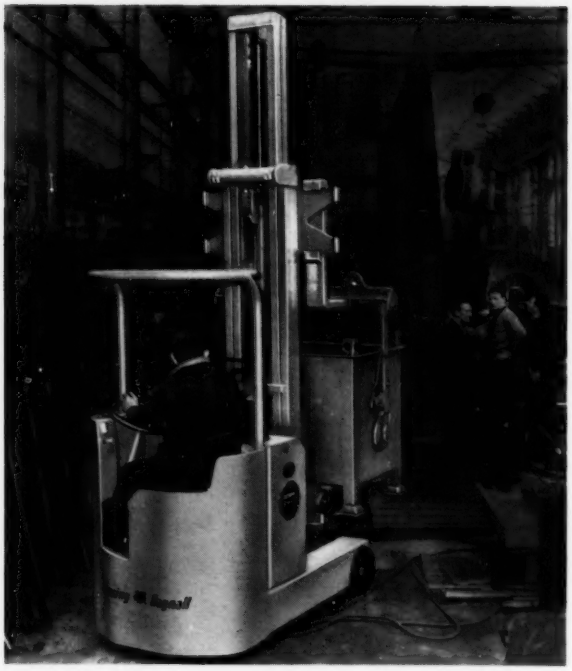


Fig. 16. Swarf from a Scharmann boring and facing mill is collected in a Fisher & Ludlow wheeled tipping pallet

Reach Trucks in Action

An estimate of the capacity and performance of the 2-ton reach truck was made on a visit to Glasgow and Paisley, where, by courtesy of their owners, the machines were seen at work on tasks for which one would not expect reach trucks to be used, but which are well suited to the capabilities of this model. In the first of these applications the truck is engaged on yard work, and the company employing it in this way are reaping the reward of having the foresight to appreciate the potentialities of the new FRER 245's.

In the second application, the reach truck is engaged on miscellaneous duties in the machine shop, yard, and storage areas. The tasks it is performing are of the sort that can be found in manufacturing areas up and down the country, but would not normally be recognized as coming within the compass of a fork lift truck.

Handling of Plywood and Wallboards

In handling quantities of plywood, chipboard and hardboard, in sizes up to 8 × 5 ft, in and around the warehouse of Messrs. Brownlee & Co., Ltd., City Saw Mills, Port Dundas, Glasgow, C.4, a FRER 245 is taking on an outsize load. The choice of a reach truck for this work is unusual and interesting and has gained the company the distinction of being the first in Scotland to acquire one of these 2-ton reach trucks.

As timber, plywood and wallboard importers and sawmillers, Brownlee stock large quantities of home-produced chipboard and imported plywood and hardboard in sheet form, and a variety of imported hardboards and softwoods in the form of logs, planks and boards. The plywood is received from the docks in bundles and crates, and Weyroc chipboard arrives by road in loose sheets from the Annan factory of The Airscrew Co. and Jicwood, Ltd. These materials are mainly 8 × 4-ft sheets and are stacked under cover in a two-storey warehouse converted from a moulding mill, in which storage and manœuvring space is restricted by columns.

Planks and boards are stored in sheds and in the open before being taken to the sawmill and drying kilns.

Until recently most of this material was unloaded by crane at the City Saw Mills and stacked by hand in the storage areas. But with the conversion of the moulding mill a determined effort was made to take full advantage of the vertical space in the building and institute mechanical methods of handling and stacking.

A full-free-lift model was chosen to combine a 12-ft lifting height with the ability to pass under doorways. Chisel forks 42 in long × 5 in wide were specified to support the 4-ft sheets, and provide the facility for sliding easily between bundles separated by spacers, and were spaced at 46-in centres on a 48-in carriage to obtain sufficient spread to support the load without excessive overhang.

The machine is used to off-load home-produced chipboard and imported plywoods from road vehicles and stack it in the warehouse, and to transfer it on to outgoing lorries and trailers. Some typical loads are shown in Figs. 10-12. The load being handled in Figs. 10 and 11 is made up of 11 crates of Douglas fir plywood in 8 × 4-ft sheets $\frac{8}{8}$ in thick. There are six sheets in each crate and the load weighs about 36 cwt. Another lift might consist of a dozen 3-cwt crates of plywood, which when tiered four lifts high would form a 16-ft stack. Chipboard is handled loose in loads of about 33 cwt and tiered to a similar height.

Loads are separated by wooden spacers on the quayside, or by suppliers, to facilitate off-loading from transport for stacking in the warehouse. Most consignments are despatched on Brownlee's own road transport fleet, which consists of Bedford articulated vehicles and a number of Jen tugs. The Bedford trailers are 8 ft wide by about 17 ft long, and are loaded from each side with four 8 × 4 ft lifts. Thus the full payload of 8 tons can be placed in four lifts.

Fig. 13 shows West African mahogany in random lengths being taken from stock to the drying kilns. Planks up to 20 ft long are handled in this way, and it is doubtful whether many people would have realized that a truck with forks set at a 52 in maximum spread could be used for such a purpose.

Brownlee are fully justified in their method of handling and choice of equipment by the reduction it has made possible in the cost of this major activity through allowing the full exploitation of warehouse space by high tiering and narrow aisles.

Handling Swarf and Palletized Work in Progress

In the Glasgow works of James Howden & Co., Ltd., the FRER 245 is doing work that no other type of truck could do. Negotiating sharp bends and operating in aisle-widths of 7 ft to 7 ft 6 in, it is handling and stacking 2-ton pallet loads and disposing of machine-shop swarf.

Known as our leading manufacturers of boiler auxiliaries, James Howden include among their products air pre-heaters, heat exchangers, heavy-duty and industrial fans, electro-precipitators, dust-extracting plant and separators, gas-washing plant, compressors, valves, auxiliary steam turbines, steam engines, and furnace fronts. In their main works at Scotland Street, Glasgow, massive plant is in course of construction and the visitor to the West Shop may see work in progress on the assembly of a Howden rotary regenerative air preheater or Howden electro-precipitator for a power station, or a sinter fan for a steelworks. These and other high-efficiency units are accepted as standard equipment in the major industrial countries of the world, and Howden are recognized as the premier makers of fans in the United

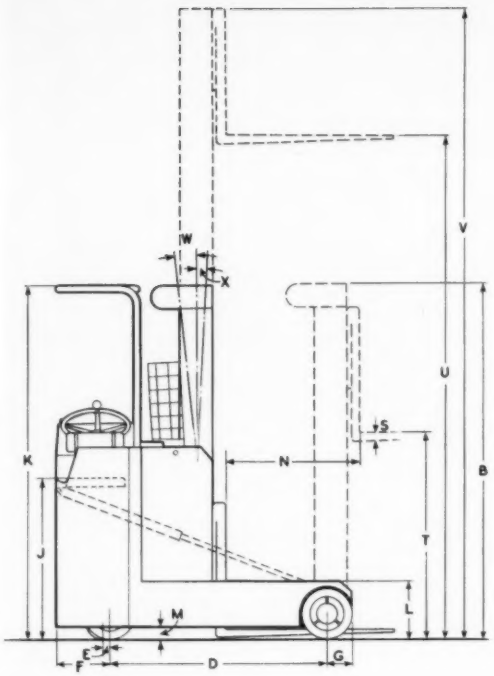


Fig. 17. Principal dimensions of FRER 245; all dimensions are in inches unless otherwise stated

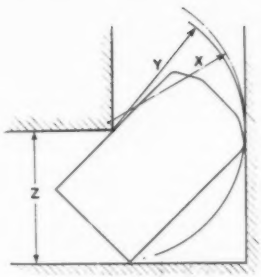
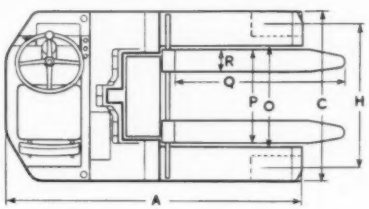


Fig. 18. Minimum space requirements, in inches, for FRER 245. These figures apply when truck is using 40-in forks and handling 40 × 40-in pallets. They do not include any working margin, and appropriate allowances must be added. →



A	Overall length, exclusive of forks	70½
B	Overall height, with mast lowered	83-120
		(Depending on model)
C	Overall width, with 'Duthane' wheels	39½
	with cushion rubber wheels	42½
D	Wheelbase	52½
E	Castor offset	1¾
F	Front overhang	12
G	Rear overhang	6
H	Track	34¼
J	Height to top of battery casing	45
K	Height to top of guard	83
L	Height of reach legs	13
M	Ground clearance	3
N	Reach travel	32
O	Width inside reach legs	23½
P	Fork spread, minimum	11
	maximum	22
Q	Length of standard fork	40
R	Width of fork	5
S	Depth of fork	1¾
T	Free lift	48⅜-85⅜
		(Depending on model, optional)
U	Maximum lift height	118-192
		(Depending on model)
V	Overall height, with mast fully raised	147½-247½
W	Maximum forward tilt	2 deg
X	Radius of outside turning circle	65 ins
Y	Width of equal intersecting aisles	60
Z	Width of aisle for 90 deg stacking	86

Kingdom. Their range covers fans that deliver pressurized air in large-capacity boiler plants and in small industrial installations, handle hot gases with entrained abrasives, exhaust pulverizing mills, carry fuel to boilers and ventilate mines and ships.

They are designed and built in the main factory at Scotland Street, Glasgow, and the branch works on the Craigton Industrial Estate. More recently, the traditional engineering activities of the company have been supplemented by the manufacture of an entirely different product, for the MacLellan Street factory, which in 1939 had been rebuilt and equipped for the production of fuselages for Botha bombers and major components of the Sunderland flying boat and Lancaster bomber, was turned over at the end of the war to the construction of steel office furniture.

During recent years the company's original multi-storey headquarters and works building has been modified and modernized as far as possible, and palletization has been introduced.

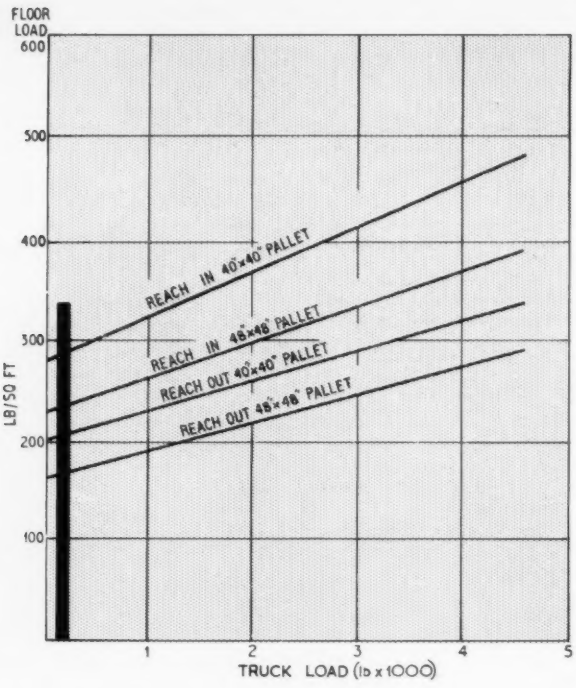
Many of the items that must be handled are impossible to palletize; for some, such as a fan-wheel of 20 ft dia, the only medium is one of the numerous overhead cranes ranging in capacity from 5 to 25 tons. On the upper floors of the building the headroom is insufficient to permit of tiering, and parts are stored in bins.

Howden are, however, handling-conscious. They have appointed a stores and materials handling controller, with responsibility for the handling function throughout their works. He has succeeded in making the bearing shop fully palletized and is introducing the system into raw-materials and casting stores, from where it will be extended gradually to all parts of the works.

Standard post pallets are used to contain raw materials and work in progress. They are based on a unit load of 30 cwt to 2 tons and are handled by the FRER reach truck. In addition to feeding the machine tools with this palletized material (Fig. 14), handling stock into and out of stores, and tiering empty pallets in the yard (Fig. 15) ready for immediate use as required, the reach truck collects swarf

TABLE 1

Rated loading capacity at 20-in centre	4,500 *lb*
Travelling speed, maximum	5 *m.p.h.*
Lifting speed, laden	30 *ft/min*
unladen	50 *ft/min*
Lowering speed, laden	*up to* 80 *ft/min*
unladen	50 *ft/min*
Max gradient, fully laden	1 *in* 12
Weight, including battery	6,400 *lb*



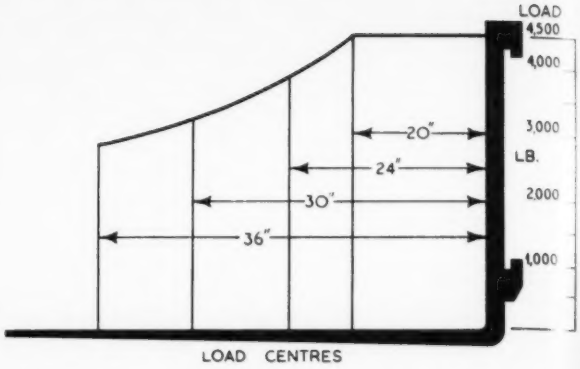


Fig. 19. Rated maximum loading for load-centres of 20, 24, 30 and 36 i

Fig. 20. Floor loading data for trucks with 40 × 40-in, and 40 × 48-pallets, given for reach-extended, and reach-retracted condition, in lb/sq. f

from the shops (Fig. 16) and transports it to the disposal area. Large quantities of this material are produced by the heavy-duty boring and milling machines. It is collected in wheeled tipping pallets, which are picked up by the reach truck and taken to a central station where the swarf is tipped out.

The FRER 245 was preceded by a series of Lansing Bagnall equipment. Four years ago, Howden acquired a pedestrian-operated FOEP fork lift truck of 1 ton capacity which was supplemented two years later by two FOER rider-operated trucks . The pedestrian-operated FOEP and one of the rider-operated machines were sent to Craighton when the 2-ton reach truck was taken into service, and materials at Scotland Street are now handled by the FRER 245, and the remaining rider-operated FOER 330 battery-electric tractor, which is used for transferring large pieces of steel plate from store to plate shop.

Choice of the 2-ton reach trucks was prompted by three main considerations. In the first place, a machine of this capacity was needed to deal with the average unit load and the heavy types of swarf. Secondly, the modified storage arrangements demanded a 14 ft lift in place of the 10 ft provided by the smaller trucks. Having determined the necessity for a load-carrying capacity of 2 tons, the final governing factor was the restricted space available for manœuvring in the shops, which eliminated equipment having non-retractable masts.

Initially the truck will be operating in the palletized areas and on swarf collection, and working a full day shift supplemented by night-shift duties when required, but it is anticipated that it will eventually go all over the factory and provision is being made for round-the-clock working. Furthermore, the machine now in service is regarded as the forerunner of a fleet and more FRER 245 trucks will be brought into commission as palletization is extended.

E. Boydell & Co., Ltd., Open New Works

E. Boydell & Co., Ltd., manufacturers of Muir-Hill dumpers, loaders and shunters have opened a new works in Christie Road, Stretford, near to their main works in Old Trafford, Manchester. To centralize sheet metal working, heavy fabrication and sub-assembly.

The object of housing these production phases under one roof is to facilitate the development of prototype units and to streamline the manufacture of all current Muir-Hill machines. A wide range of component parts, including dumper bodies, chassis, loader beams, radiator grilles, engine covers and fuel tanks, will now be produced at Christie Road.

The new premises occupy a site which offers ample room for expansion in the future. Administrative offices, heavy fabrication bay, metalworking bay and grinding and finishing bay are all housed in the main building which is flanked by a number of storehouses and a spacious metal stockyard served by three mobile cranes.

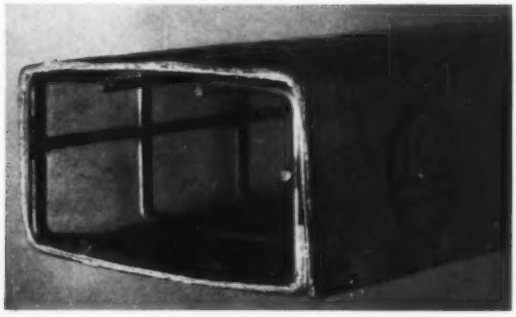
Materials entering the metalworking bay are handled by an electrically operated Felco gantry hoist. The plant in this section includes a 250-ton electro-hydraulic press brake, Pullomax cutters, guillotines, profile cutters and folding and rolling machines.

The fabrication bay contains banks of welding booths each equipped with the latest electro-welding gear and each served by independent electric hoists.

Following sub-assembly and inspection, units are prime painted and transported to the main works for final assembly.

NEW COLLAPSIBLE-SLEEVE PALLET

1



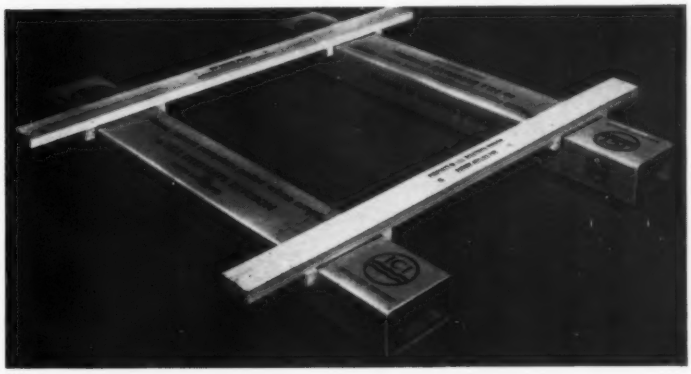
2

Fig. 1. Component parts of the 'Manjute' rigid pallet

Fig. 2. Assembly of the sleeve unit. Note the position of the open top of welded steel mesh and the stapled seam of the cover

Fig. 3. The 'Manjute' pallet assembled

Description of the factors and form of a low cost lightweight pallet of novel design, the use of which has effected considerable economies in the handling and storage of bagged materials



3

OF INTEREST to all concerned with the cost of pallets, both for maintaining existing palletization procedures and for the introduction of new palletization schemes, is the development by the Dyestuffs Division of I.C.I. of a cheap, lightweight, rigid pallet of the sleeve type, now being marketed under licence by Thomas Manning, Sons & Co., Ltd., Dundee House, Canal Street, Manchester.

The pallet is intended for handling by fork-lift truck, the forks being inserted in the sleeve units. While designed specifically for palletization of sack-packed products, it is also suitable for the handling of other types of packages, such as fibreboard and wood cases and certain types of drums, provided these are flat-topped and have no major recesses or protrusions, such as battens.

Successful Development Project

Faced with the cost of expanding their palletization of paper sacks, the Dyestuffs Division sought a cheap, expendable pallet, but could not obtain a design to satisfy their requirements. They therefore designed and developed a pallet of their own which they called the 'Manjute' rigid pallet. Though not regarded as expendable, this pallet costs considerably less than a conventional wood or metal pallet of corresponding size, and the economic advantage is increased by its light weight, collapsibility, and other favourable features.

Each 'Manjute' pallet is made up of the following components:

(1) Two welded steel-mesh sleeves—normally made from 3 × 3 in mesh—with nominal dimensions at the entry points of 6-in width and 3¼-in depth.

The standard sleeve is 45 in long (for use with a unit load of 48 in. front to back) but sleeves of other lengths can be supplied to suit unit loads of different front-to-back dimensions.

(2) Two fibreboard covers for the welded mesh sleeves.

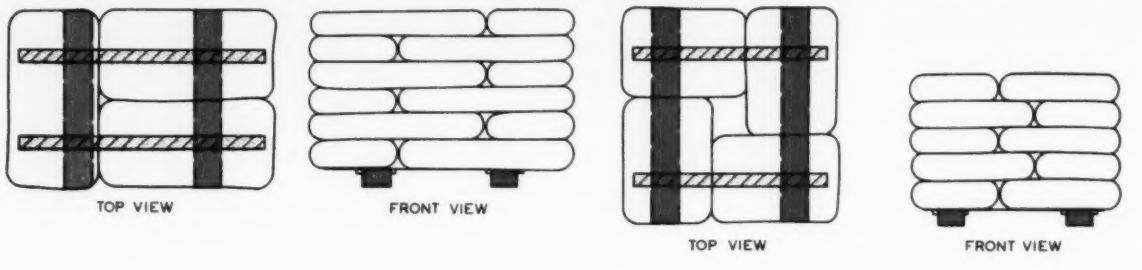
These are made of strong double-faced corrugated board, and can be supplied either plain or printed with the owner's name and address or other publicity matter.

(3) Two or more wooden deck-pieces, normally made from 3 × 1 in planed softwood, each fitted with two sets of blocks screwed to the underside of the board for placing over the sleeve units.

The standard deck-piece is 44½ in long, for use with a unit load 48 in wide, but deck-pieces of different section or length can be supplied to suit loads of other widths.

Fig. 1 shows the three basic components—welded steel-mesh sleeve, fibreboard cover, and deck piece.

In the welded mesh structure forming the sleeve, the steel wires running the length of the sleeve are all on the inside.

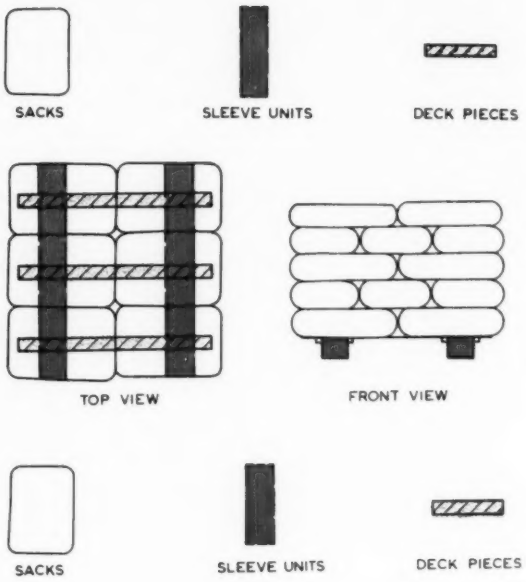


ABOVE
Fig. 4. Unit-load pattern with three sacks a layer

RIGHT
Fig. 5. Unit-load pattern with four sacks a layer

BELOW
Fig. 6. Unit-load pattern with five sacks a layer

BELOW RIGHT
Fig. 7. Unit-load pattern with six sacks a layer



This arrangement prevents fouling of the lateral wires of the sleeve by the fork of the lift truck.

To assemble the pallet, the two welded mesh sleeves are inserted in their fibreboard covers. The open top of the welded mesh unit is located in correct relationship with the stapled seam of the cover, as shown in Fig. 2. In the assembled pallet the open top of the welded mesh should be at the top of the sleeve unit and the stapled seam of the fibreboard cover should be along one of the lower edges. This ensures that the deck pieces will fit over the sleeve units without meeting any obstruction. For this purpose, the deck pieces are fitted on their undersides with wooden blocks which grip the sides of the sleeve units, locate the deck-pieces in their correct positions at right angles to the sleeves, and hold the sleeve units rigidly at the required distances apart.

If standard unit-loads only are being handled, the fibre-board covers can be supplied printed with locating lines to ensure speedy and correct positioning of the deck-pieces in the required places over the sleeve units, as shown in Fig. 1. When the required number of deck-pieces is in position, the pallet is ready to receive its load.

Palletization of Sacks

The 'Manjute' pallet was developed specifically for the palletization of materials packed in paper or hessian sacks, and the basic principles governing the successful palletiza-tion of such packages apply to the new pallet in the same way as they do to any other type of pallet. The sacks must be flat and of appropriate dimensions to give a stable and interlocked unit load. The arrangement of the sacks forming the unit depends on the dimensions of the sacks, on the type of unit load required, and on the conditions under which the load is to be handled. Unit loads for transporta-tion by road vehicle, for example, are obviously restricted in their front-to-back dimensions, while widths of gangways in stores and depots will affect the widths of the units stored in them.

The arrangement chosen for the sacks will govern the number of deck-pieces needed for the pallet. With unit loads having three of four sacks to the layer, two deck-pieces are required for each pallet, while with those having five or six sacks to the layer, three deck-pieces will be necessary. This is illustrated in Figs. 3-7.

It is important that the unit load should be so constructed that the sleeve units and deck-pieces give adequate support to the sacks comprising the first layer. This layer is the foundation of the unit load, and care in arranging the sacks of which it is composed will be well rewarded.

The sacks should preferably be arranged so that they are supported down their length, by placing them centrally over a deck-piece or a sleeve unit, both of which are illustrated in Fig. 5. If the formation of the unit is such that the sacks lying parallel with the sleeve-units cannot be located centrally over them, two deck-pieces will be necessary for their support, as in Fig. 6, together with at least one more deck-piece to support sacks at right angles to the sleeve units.

Fig. 8. Tiered loads of 25-gal fibreboard drums

Fig. 9. Arrangement of 25-gal drums on pallet

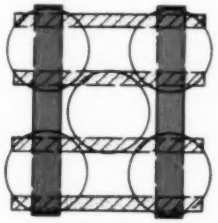


Fig. 11. Handling empty pallets

Fig. 12. Relative space requirements of 50 empty 'Manjute' pallets and an equal number of wooden pallets of similar capacity

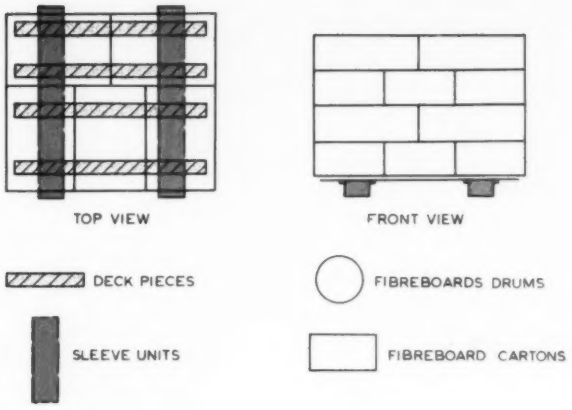
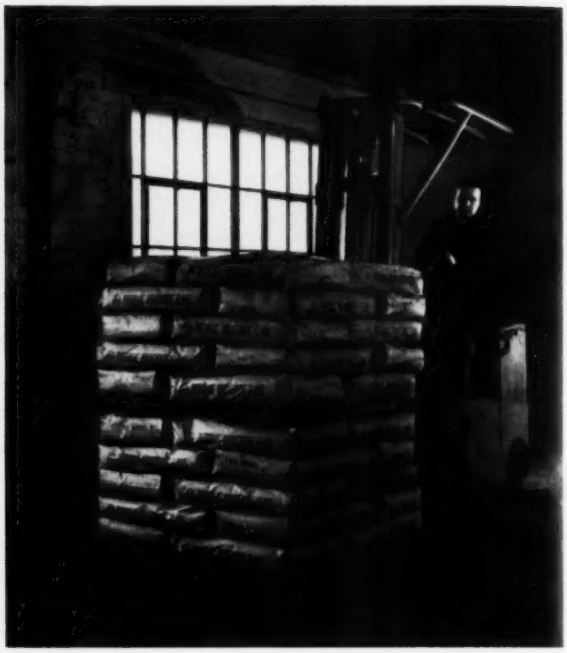


Fig. 10. Arrangement of cartons on 'Manjute' pallet

I.C.I. Dyestuffs Division use a standard unit load formation of four sacks a layer, arranged in the chimney formation shown in Fig. 5. In this formation only two deck-pieces are needed for each pallet. The pallet is designed in such a way that the sacks of the first layer lying parallel with the sleeve units are supported centrally down their length by the sleeve units themselves, and the sacks lying at right angles to the sleeve units are supported centrally down their length by the deck-pieces. The unit loads are approximately 4 ft square and 24 can be accommodated on a 15-ton lorry, 12 being laid on the deck, in two rows of six along each side, and 12 on top.

13

Fig. 13. Unit load on a 'Manjute' rigid pallet



14

Fig. 14. Handling two unit loads at a time

As with any other pallet, it is important that the sack be designed with the pallet in mind, and vice versa, so that sack and pallet can be employed together to produce an integrated unit. The edges of the load should preferably be flush with the extremities of the sleeve units and deck-pieces. As with other types of pallets, the sacks should not be allowed to sag over sleeve units that afford the means of entry for the forks of the lift truck. Any tendency in this direction might cause the sacks to be damaged by the forks during handling operations. The sleeve units and deck-pieces should not be allowed to stand proud of the load and thus be liable to catch on the sacks of other unit loads and damage them.

Palletization of Cartons and Drums

Subject to the provisions already mentioned, packages other than sacks can be successfully palletized on the 'Manjute' pallet. As with sacks, the number of deck-pieces required per pallet is governed by the size, shape, and arrangement of the packages comprising the first layer of the unit load.

Fig. 8 shows 'Manjute' pallets being used for the palletization of 25-gal fibreboard drums in a unit load of five drums. It will be seen that each pallet has been fitted with four deck-pieces. A plan view of the arrangement of drums on the pallet is shown in Fig. 9. A typical arrangement of cartons on a 'Manjute' pallet is shown in Fig. 10.

Other Uses for the Rigid Pallet

The 'Manjute' pallet can also be used for the palletization of a variety of other goods, such as bales, or sheets of paper, board or hardboard, hardwood, or fibreboard and paper packages in the flat. If necessary, the goods can be strapped together on the pallet, or strapped to the pallet through the sleeve units.

Advantages of the New Pallet

Initial outlay on the 'Manjute' pallet is low, and every component is immediately replaceable at a small cost. Labour and overhead charges for the maintenance and repair of pallets are greatly reduced, if not entirely eliminated, by the use of this new system.

The Pallets are Light in Weight

The complete standard pallet, with two wooden deck pieces, weighs approximately 15 lb and Fig. 11 shows that it can be handled empty with ease. The low weight of the pallet enables the gross weight of each unit load to be reduced, and greater lorry payloads, in terms of net weight per consignment, to be achieved.

Provided the pallets are lifted on forks of adequate length, unit loads of over 1 ton can be handled satisfactorily. At I.C.I. two 1,840-lb loads at a time on 'Manjute' pallets have been handled by fork lift truck as shown in Fig. 14, and have been stacked four units high with complete satisfaction.

When empty, the new pallet can be instantly collapsed for storage, or for return from customers. When collapsed, with the deck pieces inserted inside the sleeve units, the pallet occupies only one-sixth of the space of a corresponding wood or metal pallet (Fig. 12). This leads to a considerable saving in storage space and cost, and to a saving of approximately 75 per cent on the return carriage charges incurred when wood pallets are handled.

A unit load on a 'Manjute' pallet is approximately 2 in–3 in less in height than the same load would be if placed on a wood pallet. This leads to a reduction of up to 12 in on the height of a stack of four unit loads, in certain circumstances making it possible to store one or more unit load per stack, with 25% better utilization of storage space.

Operating Technique

Satisfactory operation of the pallets depends primarily on

the provision of adequate support for the sleeve units. In the first place, they should be properly supported by the forks of the lift truck during handling operations. The length of the forks should be not less than three-quarters of the front-to-back dimension of the unit load. Forks of at least 36 in length are required, therefore, for handling units of 48 in front-to-back dimension. Preferably for maximum support they should be the same length as the sleeve-units. If this requirement entails the purchase of new forks, their cost will be insignificant compared with the saving on the pallets.

The forks should preferably be 4 in and not more than 5 in wide, and not greater than 2 in thick at the heel. A taper on the front of the forks facilitates their insertion in the sleeve units. The forks must be capable of being spaced apart at a distance of 28 in between their centres for operating with the standard size of pallet.

The forks of the lift truck should be fully inserted in the sleeve units. It is recommended that the driver should raise the load a few inches at least, before the mast is tilted and the load lifted. Figs 13 and 14 show unit loads of I.C.I. sack-packed products being handled by fork-lift truck.

The sleeve units of loaded pallets should rest on flat surfaces, to avoid the distortion to which they would be liable if inadequately supported. Packages which present a flat-topped surface are suitable for palletization with the new pallet. Examples of these are paper or hessian sacks, fibreboard and plywood cases, flat-topped drums without recessed lids, and other packages or goods of a flat nature.

The sleeve units of loads should not be allowed to rest over the raves, or chock rails, of lorries without being supported. I.C.I. have overcome this problem by arranging with their transport contractors to use base-boards to line the decks of lorries used for transporting the new pallets. The base-boards raise the sleeve units to the height of the raves, as shown in Fig. 15, and support them along their length. They are not left at the customer's premises with the unit loads, but remain on the lorry for use with the next palletized consignment. If 8-ft wide lorries can be obtained without raves, or with hinged raves that can be swung downward, no base-boards are required.

The pallets cannot be handled directly by platform or pallet truck. If it is required that this type of equipment shall be used the load on its sleeve pallet should be placed on a wooden pallet or stillage, which can then be picked up and transported by a truck with platform or pallet fingers in place of forks. The fork truck would operate on the 'Manjute' pallet only, leaving the wood pallet or stillage free for further use. This method would be economical of the wood pallets or stillages.

New Pallet now in Service at I.C.I. When initial experiments had indicated a promising future for the new sleeve pallet, I.C.I. Dyestuffs Division applied for patent cover and began a series of warehousing and transportation tests. These were so successful that the Division placed 2,500 pallets in commission. They were used for the storage and despatch to customers of unit loads

Fig. 15. Loading on to lorry with base-board deck lining

ABOVE
Fig. 17. An example of the space-economy effected in the storage area

Fig. 16. Palletized consignment of 24 unit loads

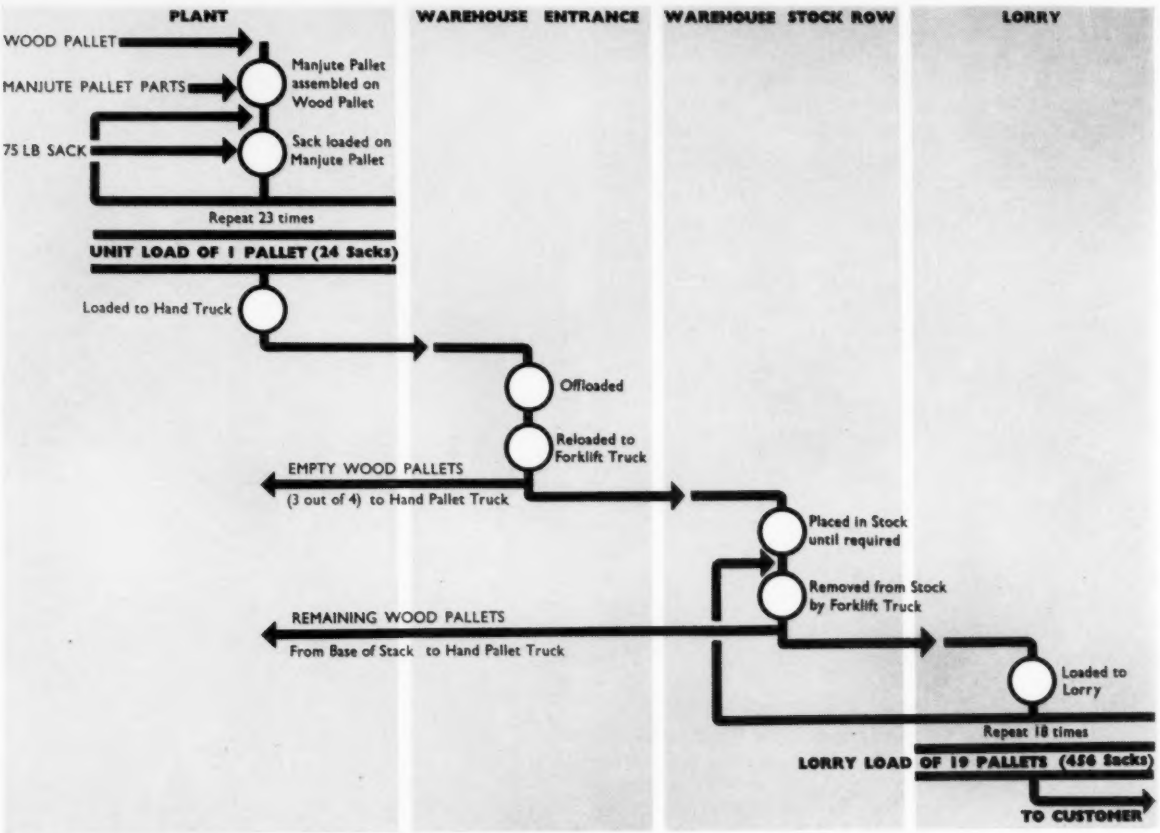


Fig. 18. Flowsheet of a specific application—the handling of phthalic anhydride flake

of paper sacks containing phthalic anhydride flake, rubber chemical products in flake and powder forms, nylon polymer chips, and other intermediate products.

Fig. 16 shows a consignment of 24 unit loads of rubber chemical products palletized prior to despatch to one of the Division's customers. Fig. 17, showing the storage of tiered unit loads of phthalic anhydride flake, illustrates the stacking properties of the new pallet.

Favourable reports from customers taking delivery of consignments on the 'Manjute' pallet influenced the Division's decision to make the system available for other users of materials handling equipment, and a licence was granted to Thomas Manning Sons & Co., Ltd., to market the invention.

It is expected that the economies effected by the 'Manjute' pallet in reducing capital outlay and in storage and return transport costs will be particularly attractive to the small firm having only a limited amount of capital for sinking in handling equipment and warehousing accommodation. There is no doubt that these pallets would do much to reduce the financial handicap under which the small company often operates compared with its larger competitors.

A Specific Application

I.C.I. Dyestuffs Division pack phthalic anhydride flake in block-bottom-valve sacks. When filled these sacks measure approximately 19 × 29 × 6 in and contain 75 lb of material.

The sacks are palletized on 'Manjute' pallets. They are arranged as shown in Fig. 4—four to a layer in six layers, to constitute a unit load of 24 sacks.

The procedure is in six stages. First the pallet is assembled near the filling station on a wooden pallet. As they are filled, the sacks are loaded on to it. When the unit load is complete, it is picked up on its wooden pallet by a hand pallet truck and taken to the warehouse. The distance to the warehouse being approximately 40 yd, the pallet truck is then returned to the filling plant.

When several unit loads have been received in the warehouse, they are tiered by a fork lift truck. A wooden pallet is used to form a base for each stack, and the rest are returned to the filling station.

When a consignment is called for by a customer, the lift truck takes the unit loads from the stacks and loads them on a lorry provided with base boards. The unloading procedure at the customer's premises is broadly the reverse of the system described. The pallets used are of the standard 'Manjute' size. A load of 19 units is accommodated on a 16-ton vehicle and constitutes a net payload of 15¼ tons.

The return carriage charge is one-quarter of that incurred when wooden pallets are used. One man with a fork lift truck can load a lorry in approximately half an hour. The driver only has to supervise the operation. To load the same quantity of loose sacks, two men would need about two hours, both men working very hard.

The palletization scheme has brought savings in package costs, because it has been found that a cheaper sack can be used; in warehousing space, which has been trebled; and in labour. The use of 'Manjute' pallets instead of wooden ones has brought additional savings in capital cost, return carriage costs, space (particularly for storing empties), and maintenance.

Materials Handling Equipment Installed at Whitehall Printeries, Leeds

MECHANIZED BOOK BINDING

BY J. A. OATES

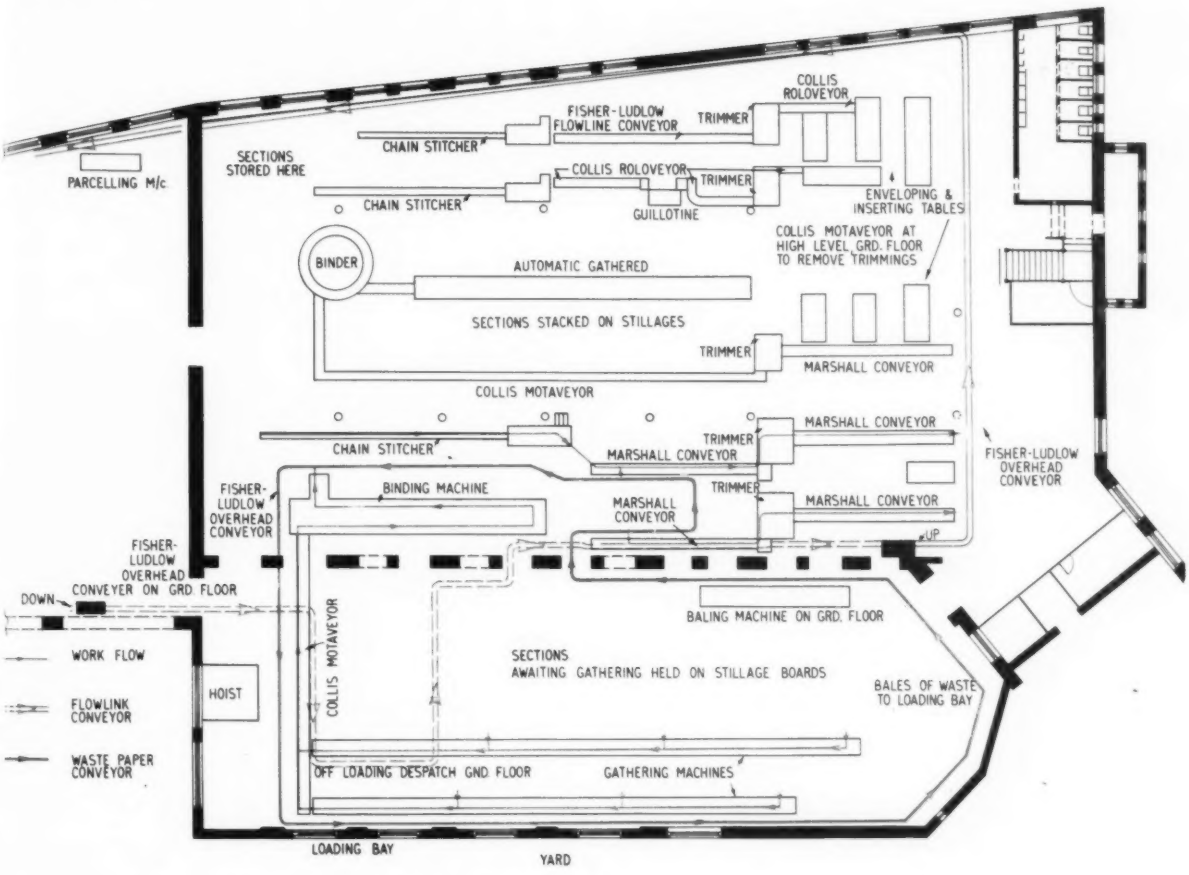


Fig. 1. General layout of No. 1 and No. 2 lines. The direction of work flow, the 'Flowlink' drying conveyor and part of the 728-ft 'Flowlink' conveyor feeding the wrapping machine and Despatch Dept. are indicated in this Plan

ALTHOUGH most printing firms are willing to spend considerable sums on the purchase of the latest high-speed machines, only a few seem to appreciate the fact that output can be increased, and considerable economies effected, by giving serious attention to the interstage handling of their products. It is a fairly safe assumption that in most places all products are handled manually more than a dozen times before they leave the works.

The advantages to be gained from linking the various processes, and so eliminating repeated manual stacking and restacking, transportation and other forms of handling, were appreciated by the well-known printing firm Petty & Sons, Ltd., of Whitehall Printeries, Leeds, who have made very efficient use of the various types of handling equipment available to Industry.

The firm was started in 1865, with a staff of five: to-day there are 556 employees, and some idea of the volume of work handled may be gauged from the fact that the amount of paper passing weekly through the works is in the region of 70 tons. The firm are commercial printers specializing in the production of catalogues, particularly those of the mail order type, handling the work through all stages from art work onwards. Equipment is available for producing both letterpress and lithographic work. The company are specializing in the process known as 'perfect binding' or 'unsewn binding'. Instead of the books being bound by side or saddle stitching or sewing, a flexible adhesive is used; the advantages of this process include the fact that even the thickest book lies perfectly flat, no matter where it is opened.

The plant described later has been laid down to enable the mass production of the types of catalogues mentioned earlier, the largest of which, at present, is approximately $1\frac{1}{8}$ in thick, weighs 4 lb and has just over 600 pages. It is quite likely that in the future these figures will be exceeded.

Fig. 2. The start of one of the 'gathering' or collating lines, looking towards the delivery end

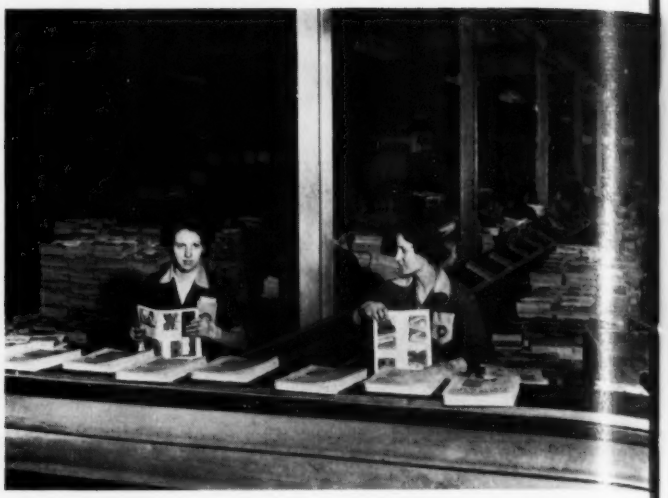


Fig. 3. 'Knocking-up' the sections at the delivery end of one of the collating lines

Should this occur, the layout of the plant is such that these larger books can be accommodated without difficulty. Another activity is to be the printing and binding of very large quantities of pocket-size books, and for this venture the new plant will prove exceedingly useful.

No. 1 and 2 Lines

There are four lines on the book binding floor, two of which are said to be among the most highly mechanized installations of their kind in the country. At the time of writing one of these lines was engaged with the binding of the large 600-page, 4-lb mail order catalogue mentioned earlier, the daily output of which weighs about 36 tons. The weight problem was one of the main factors influencing the design and layout of the line, because each unnecessary handling of the catalogues during binding added another 36 ton to the daily weight moved by manual means. It will be appreciated that to a certain extent the layout of the department was governed by the need to adapt it to the existing building. However, a new factory is being built nearby, and when this is equipped it will be possible to lay down theoretically correct lines giving even better work flow conditions.

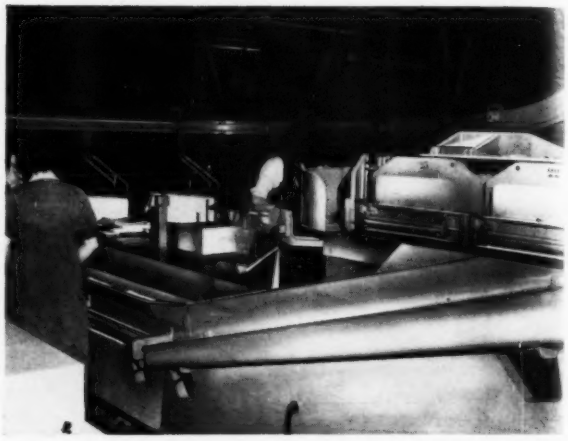


Fig. 4. The first station on the Martini automatic binding line: the operator is seen transferring the sections from the MotaVeyor to the binding machine

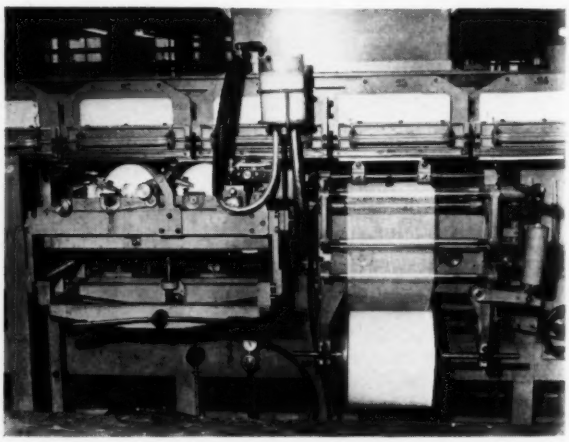
Collating or 'Gathering'

The pages, printed in another department, enter the binding department as either 8- or 16-page sections, and are stacked in numerical sequence on tables at the side of the 'gathering' or 'collating' lines (Fig. 2). There are two such lines, either or both of which can be in operation at the same time. Fig. 2 is a view along one of these lines, looking towards the delivery end.

The conveyor comprises a steel sheet taper-side trough, at the bottom of which runs an endless chain carrying projecting 'pusher bars'. The first girl (foreground in Fig. 2) lays two (or sometimes more, according to the size of the book) sections in the trough, in numerical sequence. One of the pusher bars carries these on to the second girl, who places her sections on top of them: the third girl adds her pages, and so on all along the lines. The speed of the conveyor is variable to give outputs of 1,000-1,500 books/hr.

The sections are always placed with the 'head' of the page at the bottom of the trough, and with the 'spine' against the pusher: this is essential in order to ensure that all pages are correctly positioned in the finished book. The sections are specially stacked on the tables in such a manner that the

Fig. 5. Two stations on the Martini binder for (left to right) applying the adhesive and the 'mull' to the spine



girls automatically pick them up in the correct sequence and the correct way round.

Fig. 3 shows the delivery end of the line illustrated in Fig. 2. Here, two girls lift up the complete sets of pages, 'knock' them on the head and then on the spine, to ensure that all these edges are level: these become, in effect, datum edges for subsequent operations. In Fig. 3, the right-hand girl is seen 'knocking' her pages on the head, and the other is 'knocking' the spine: this operation consists in tapping the pages, held loosely in the hand, on to a steel-topped table.

At right angles to the two gathering lines is a 42-ft Collis MotaVeyor light-type conveyor of sectional design. It has a 12-in wide solid woven cotton belt moving at a speed of 54 ft/min. On the table under the belt is an auxiliary bed of 1-in thick block board which raises the belt from its normal bed, so allowing the finger tips of the next operators to pass under the edge. Drive is from a $\frac{1}{2}$-h.p. variable-speed motor giving speeds of 30-60 ft/min.

After 'knocking up', the girls in Fig. 3 place their pages on the belt, with one edge overhanging one or other side so that the next girl can pick them up easily and without disturbing their position: this is facilitated by the fact that the belt is raised on the wood bed. Should the belt be stopped because of a hold-up at later stages, the girls place their pages on 'overflow' tables (see Fig. 1) situated within easy reach.

Binding

This belt feeds an ingenious Martini automatic adhesive binding machine, which itself incorporates many clever handling devices. It is capable of binding up to 5,500 books/hr and requires only three or four attendants.

Two girls, one on each side of the MotaVeyor belt, remove the sets of pages and place them on to $\frac{1}{2}$-in wide chain conveyor (carrying pusher bars) forming an endless circuit around the inclined section seen in Fig. 4: as before, the pages are placed spine downwards and with the head against the pusher bar. The chain conveyor, situated at the bottom of a narrow, deep trough, carries the pages up the incline to the first station on the machine: here, vibratory mechanism jogs them down on to the spine and against the head to ensure perfect alignment of these edges. The pages

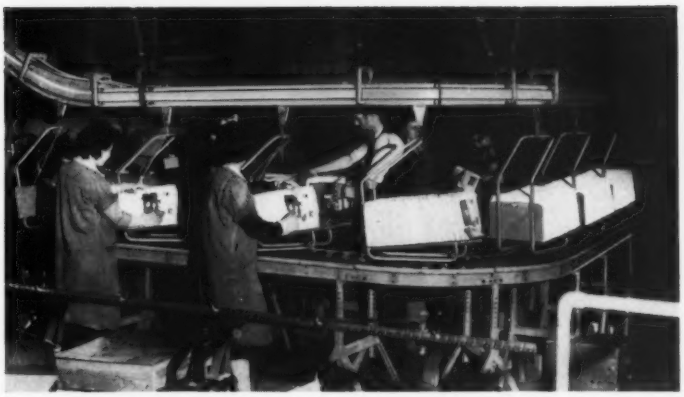


Fig. 6. Transferring bound books from the Martini binder to the 'Flowlink' drying conveyor: note that the moving carriers rest on a gravity roller conveyor

Fig. 7. (Below) The 339-ft 'Flowlink' drying conveyor descending to waist level to facilitate unloading

Fig. 8. (Below) Transferring dried books from the 'Flowlink' chain conveyor to the flat-top belt conveyor feeding the three-knife trimmer: as in Fig. 6, the carriers rest on a gravity roller track

Fig. 9. (Below Right) After trimming, the books are carried to a second 'Flowlink' chain conveyor (left), on to which they are transferred for despatch to the wrapping machine. On the right the conveyor is seen emerging through the floor after leaving the Despatch Bay, situated at street level

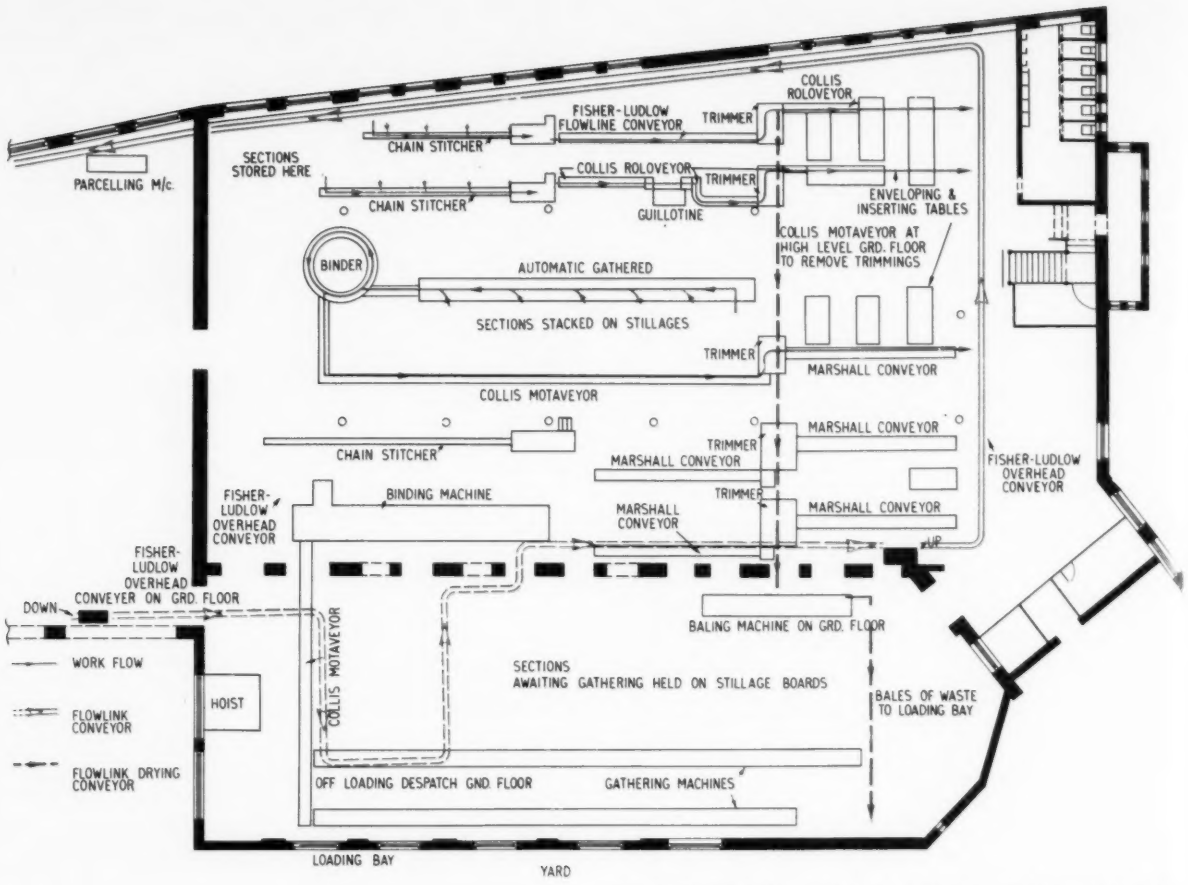


Fig. 10. The general layout of No. 3, 4 and 5 lines. The diagram shows the work flow, the 'Flowlink' conveyor as well as the waste paper conveyor

now enter a device known as a 'transport clamp', in which they are automatically gripped for subsequent operations: 28 of these clamps move in an endless circuit around the machine: several may be seen in Fig. 5. The design is such that the spine of the book projects a short distance below the clamp, as may be seen at the right-hand station in Fig. 5.

At the next station the book passes over a high-speed horizontal rotary knife which cuts away the bottom of the spine, thus converting the folded sections into separate pages. A suction device removes the thin slivers of paper and transfers them, *via* a chute, to a collecting station situated elsewhere in the department.

During subsequent operations the spine is roughened and the fine dust removed, adhesive applied to the face and sides of the spine, special muslin (known as 'mull') applied (Fig. 5), and the cover added and pressed firmly into position: all operations are performed completely automatically.

After the last operation, the transport clamp opens, allowing the books to fall, spine downwards, on to a nylon belt situated at the bottom of a trough of similar design to that in Fig. 4. This carries them to a metal-top delivery table, where they are automatically stacked, spine downwards.

The Drying Conveyor

The adhesive applied to the spine is a cold-setting polyvinyl requiring a setting time of 30 min. Encircling the gathering section and binding machine is a standard Fisher and Ludlow 'Flowlink' overhead chain conveyor with 127 perforated tray-type carriers such as seen in Figs. 6 and 7: these are spaced at 2 ft 8 in pitch and designed to carry a maximum load of 78 lb. The circuit length is 339 ft, and with a speed of 4·73 ft/min the carriers traverse the complete circuit in just 52 min: the capacity is approximately 2,500 books/hr.

This system, installed at the end of last year, carries a total load of 4 tons when in full operation. In the near future it is to be extended to twice its present length and the chain speed altered to give a capacity of 8 tons/hr. Because of the size and close pitch of the carriers, the present conveyor is driven by a Caterpillar unit. The books are placed spine downwards on the carriers so that their weight presses downwards to keep the book firmly against the cover during the drying period: because of this, the carriers are perforated in order to facilitate drying by permitting maximum circulation of air around the spine.

Close to the delivery table of the binding machine the conveyor descends to waist level (Fig. 6) and the carriers are loaded manually with books from the table, the latter being kept together by means of a weighted cord. As soon as the carriers clear the loading area they rise steeply until well clear of all plant and personnel, and commence their 52-min circuit to allow the adhesive to set before trimming.

Fig. 6 shows the conveyor descending to waist level near the end of the circuit, and passing through a wall to reach two three-knife trimming machines situated on the other side.

It should be mentioned that at both the loading and

unloading stations the carriers are steadied on a 12-in wide Fisher and Ludlow 'Flowroll' gravity roller conveyor: these may be seen in Figs. 6 and 8. That at the loading section comprises a 90-deg bend, and the other is a U-bend.

Trimming and Wrapping

In Fig. 8 the conveyor has just passed through the space in the wall, and the dried books are being transferred manually to two 12-in wide Marshall solid woven cotton belt light-type sectional conveyors. The length is approximately 20 ft, and the speed of the 1-h.p. driving motor is variable to give belt speeds of 1½-20 ft/min. There are two such conveyors, each feeding a three-knife trimming machine, but at the time of writing, only one trimmer was in use. On the left of the machine may be seen the 'overflow' table on which the operator places any books that he is unable to handle at the moment.

Several books, up to a total thickness of 4 in, can be trimmed at the same time. Two knives descend to trim the head and tail simultaneously, and then a third knife trims the fore edge. When the last knife withdraws, the action of feeding the next pile into the trimming position automatically ejects the finished books on to the belt of another Marshall conveyor leading to a second 'Flowlink' overhead chain conveyor (Fig. 9), on which they are taken to the wrapping machine.

This 'Flowlink' conveyor, installed in 1956, incorporates two ¾-h.p. drive units fitted with Vulcan-Sinclair fluid couplings. As will be seen later, it circulates around the first-floor binding and wrapping departments, descends at an angle of 60 deg for unloading at the ground level Despatch department and then rises at 60 deg to re-enter the first-floor departments. The total length of this tortuous circuit is 728 ft.

The 273 carriers on this system are spaced at the same centre distances as before, but move at a faster speed, i.e. 23 ft/min: this gives a delivery rate of 9 trays/min, in comparison with 2 trays/min on the slower drying conveyor. As a matter of interest, it may be mentioned that the chains of the first conveyor are designed to carry a maximum load of 100 lb/2 ft 8in length, and those of the second conveyor are suitable for loads up to 56 lb/section, including the weight of the trays.

The books are stacked on the carriers in sixes or multiples of six, as the wrapping machine is arranged in this particular instance to handle six books at a time. The books are lifted off in piles of six, and completely wrapped and sealed in 6 sec, this giving an output of 10 parcels/min.

There are three other binding lines in addition to that just described (see Fig. 10), and if these are in operation the books from them are also placed on this conveyor for transport to the wrapping machines: there are two such machines, but in the case of the particular book under consideration, one machine is capable of handling the full output. If one other line is in use, the books from each line are placed on every alternate carrier: should three lines be operating, the books (which would be for different customers) from each would be placed on every third carrier.

Despatch

After wrapping, the parcels are replaced on the 'Flowlink' conveyor and transported to the Despatch department (situated on the ground floor), where they are off-loaded and stacked on pallets in 1-ton loads. The fully loaded pallet is removed by Lansing-Bagnall fork reach truck to a prestacking area for loading on to a lorry.

If a lorry is immediately available, the pallet is deposited at the side of it, from where it is picked up by a Lansing

Fig. 11. Loading the Ehlermann automatic 'gathering' or collating machine

Fig. 12. Bound books leaving the Mueller automatic binder for transference to the manual drying conveyor

Bagnall fork lifter and loaded on to one side of the lorry. While this is being done, the fork reach truck has returned with another pallet, which is deposited at the other side of the lorry, from where it is loaded in the manner just mentioned. This sequence of loading from alternative sides is continued until the lorry is completely loaded: the full load of 14 ton is handled in 35 min. It will be appreciated that with heavy loads such as this the springs of the lorry would be badly strained, or the lorry perhaps tipped over, if one side was completely loaded before the other.

No. 2 Binding Line

Adjacent to the line dealt with above is a second semi-automatic binding line, incorporating machines of a different type from those already described. The first (Fig. 11) is an Ehlermann automatic 'gatherer' or collator which performs automatically the type of work done manually by the girls seen in Fig. 2. The sections are stacked in sequence along the machine, and the bottom section of each stack automatically drops on top of the pages from the preceding stacks (carried on a conveyor) until, at the delivery end, there is a complete set of sections. The output is up to 3,500 books/hr, according to the number of pages. Safety devices stop the machine, sound a buzzer and flash warning lights in the event of a miss-feed at any station, incorrect placing of pages, etc. The sections are drawn from the stacks by three vacuum suckers.

At the delivery end, the books are manually 'knocked up' on the spine and head, as before, and placed spine downwards in a rotary Mueller fully automatic Rotorbinder. Here they undergo a series of operations similar to those on the binding machine described earlier, and emerge as bound books, complete with cover, but untrimmed.

The books are automatically ejected on to a short sloping conveyor (Fig. 12) and carried to a girl who stacks them (spine downwards) in special metal containers, on a Rolaveyor conveyor (Fig. 13) for the drying cycle. As each container is added, the previous containers are pushed (manually) further along the conveyor, the length of which is such as to give one hour's drying time before the trimming machine is reached (refer Fig. 10).

The remaining stages are similar to those of No. 1 line, i.e. after trimming, the books are pushed on to a flat-topped power-driven conveyor and carried to the 'Flowlink' conveyor mentioned earlier, which conducts them to the wrapping machine.

Other Lines

There are three more lines (No. 3, 4, 5), but these are concerned with the binding of lighter books by the saddle stitching process. These also feed to the 'Flowlink' conveyor which carries the books on to the wrapping machines. However, only on rare occasions are all five lines in operation simultaneously.

Waste Disposal

Large quantities of paper waste are produced at the various trimming machines, and the efficient removal of this from the working areas is a matter of considerable importance. The fact that the waste is in the form of flimsy slivers of paper, which tend to pile up, introduces certain complications.

From each machine, the waste falls into a chute feeding a Collis MotaVeyor 24-in belt conveyor suspended from the ceiling of the department situated on the floor below; in order to avoid spillage the belt is enclosed in a sheet metal trough. A blast of compressed air (from the trimming machine) speeds the downward movement of the light paper cuttings and prevents them from sticking to the sides of the chute, and from building-up into a pile likely to cause choking.

The 75-ft long conveyor runs practically the complete width of the department in order to serve all five trimming machines (refer Fig. 10) and is capable of handling 20 lb or more paper per minute. On average, it removes 3 ton of paper per 9-hr shift. The conveyor discharges to a baling machine situated at ground level, close to the Despatch Bay.

Fig. 13. Part of the manually operated drying line for No. 3 section

HOW GREATER USE OF INDUSTRIAL TRUCKS CAN BENEFIT THE BRITISH ECONOMY

By G. DOWNIE

This paper by Mr. Downie, which we publish in full, won for the author the 1959 John Morris Memorial Award. The award is made by the British Industrial Truck Association and entitles the recipient to attend the Sixth Materials Handling Training Course at Lake Placid, U.S.A.

BY DEFINITION, industrial trucks are: 'wheeled vehicles used in industry for lifting and shifting and may be powered or unpowered'. The range covers tractors, platform trucks, pallet trucks, and fork lift trucks.

'The British economy', as used in the title of this paper, is taken to mean that Great Britain, as an industrial country, has to earn, by its exports, the exchange necessary to finance the import of most of its raw materials and half its food requirements.

Since, in many industries, handling represents a major part of the cost of production, it follows that in Britain, to maintain, let alone improve, our standard of living, our exports must be competitive in the world's markets. This necessity coincides with a call for a shorter working week in industry. This, at first, may seem a contradiction of terms, but is, in fact, a challenge to the ingenuity of management at all levels to effect a solution or reconciliation of opposing factors by progressively increasing productivity throughout industry.

This paper is concerned with only one facet of increased productivity, that of the industrial truck and its role in the field of materials handling. In this field, more than in any other single sector of our industrial life, some of the greatest advances have still to be made. It is here that the industrial truck can exert its influence in contributing to the increase in productivity, yet, at the same time, lowering the cost, the personal fatigue and the space required in a wide variety of industrial applications.

Historically, we know that in the United Kingdom so much of our scientific and technological effort in the past has been, and maybe still is, devoted to inventing, discovering or improving processes that the techniques of moving the commodities concerned have become neglected. Yet, as an island nation, so much of our livelihood depends upon handling and transporting things to where they are required; firstly, the indigenous materials from their source in this country, secondly, the imported raw materials which must be handled through our ports and upon which we depend so heavily. In both instances, there is movement in all phases of handling and transport, as well as in manufacturing or inter-process handling, and final distribution to the consumer. This production cycle is depicted in Fig. 1 and applies, with only minor deviation, to most industrial processes.

Before any useful assessment of the increased use of industrial trucks can be made it is necessary to determine what is the cost of handling at present.

Consider the following:—In 1958, the wage bill in the manufacturing industry in Britain was of the order of £3,830 million, of which it is estimated the cost of materials handling accounts for about one-third of this sum—say—£1,300 million. It is an accepted fact that a high proportion of this figure arises from inefficient handling of one kind or another and for a variety of reasons.

It has been stated that the human body can produce a physical effort of approximately $\frac{1}{8}$ h.p./hr = 40s./h.p./hr (at—say—5s./hr), whereas one unit of electricity will supply $1\frac{1}{8}$ h.p. for an hour at a cost of mere pence.

Prima facie, therefore, an industrial truck which can supply adequate horsepower at low cost and, at the same time, facilitate and reduce the cost of movement at any one or all of the stages mentioned in Fig. 1 has a tremendous potential. In this context one might almost say the extent of the increase to be made in the use of industrial trucks can be measured by observing the extent to which it is NOT being used in industry at the present time!

Wages/Prices

Consider the index of wage rates for all industries in the United Kingdom over the past three years (January, 1956/January, 1959, inclusive). Taking January, 1956, as 100 it will be seen that by January, 1959, the wages index was 116 and that this rise had been continuous. This has not been entirely due to rising prices, since in the same period the retail price index has risen only from 100 to 110—the *real increase in wages* over and above the price increase has been some 6 per cent.

To summarize and put our subject in its proper perspective, it is recognized that handling is a service, in a literal sense non-productive and at present very costly, whilst the crying need today is for higher productivity. It follows, therefore, that any improvement and economy which can be made in the field of handling will be in the best interests of both industry and the nation.

How can this tremendous potential for efficient movement be fully exploited? Possibly the most practical answer is to look 'where' it might be exploited. Consider the following sectors of industrial life in the United Kingdom.

Handling in the Manufacturing Industry

In British manufacturing industries probably the most marked or most publicised advances have been noted as far as the adoption of the industrial truck is concerned, and few would question the lasting superiority of a fork truck, pallet truck or powered carrier and their many variants in most of

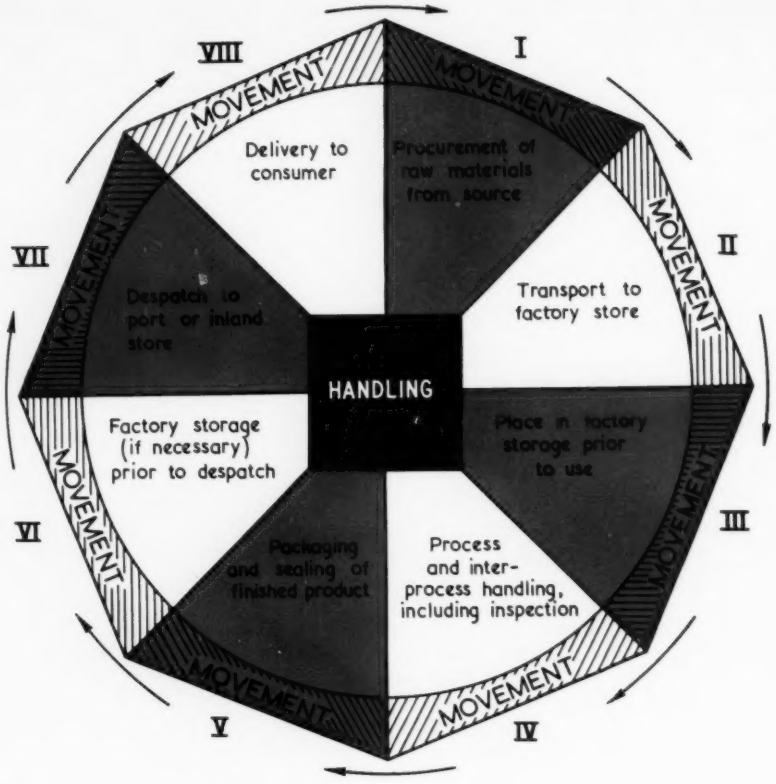


Fig. 1. The production cycle

our industries, but again, how many have *not* adopted this method of handling? Some measure of this can be gained by consideration of the volume of throughout movement of unit or pallet loads within the United Kingdom. So far it is lamentably meagre and equally slow to develop. Is not this a challenge to the industrial truck?

Handling in Transport (Land Borne)

Quite apart from manufacture, it may be estimated that nearly £900 million is spent in this country on the transport of goods each year; a figure which, it should be noted, is equivalent to almost 4½ per cent of the national expenditure. Since this cost includes terminal movement, here is yet another field for the advancement of the industrial truck and one in which many millions might be saved if the many variants of truck available could be more widely adopted.

It will readily be realized that every time a commodity is moved, every time it is handled and even when it is standing still, the selling price meter is mounting in terms of final cost which includes, inter alia, handling and movement charges. Clearly, the guiding principles in the economy must be to reduce handling and storage to a reasonable minimum depending, of course, upon the characteristics of the commodity in mind. Thus, the industrial truck is concerned with supplying the need, which is the *essential* movement, i.e. the most economic and efficient movement which has been determined after study by experienced handling men.

Handling in Ports

We have seen that, as an island nation, we depend largely upon our import/export business, by which we mean, in handling terms, moving commodities into and out of ships and, to a lesser extent, aircraft. In the last decade we have seen the beginnings of a movement in the ports of the world towards the rationalization of handling.

For example, in Burutu in West Africa, the progress made by the recent introduction of mechanical handling equipment has been fully justified. It has made Burutu the most efficient and up-to-date mechanically equipped port in British West Africa and Ghana where there are some 14 ports over a coast line of 1,000 miles. Experiments are now being undertaken to try and develop the principle of 'through-palletized-loads' to stations as far away as 1,000 miles up river.

Again, take New Orleans where a large cargo ship can now be turned round in 2·8 days, stated to be the fastest recorded time for ships of such size in a United States port and, no doubt, for a European port. This is attributed to the fact that in handling the cargo, use is made of the most modern equipment and techniques. In this connection, pallets are used for literally hundreds of different commodities, affording orderly, space-saving stacking and assembling of cargo on the wharves. Fork lift trucks carrying loads of up to 5 tons at a time, offer up goods at ship's side where standard cargo handling devices (such as slings, nets, conveyor belts, loops, etc.) are used for stowage aboard ship.

It is equally well known that considerable advances have been made in the United Kingdom ports in terms of cargo handling. Since 1945 the capital investment in port improvements has been £35 million. Nevertheless, so much remains to be done in this connection that the future of the industrial truck ashore or afloat is readily assured.

Consider the shipping of palletized cargo from Scandinavian ports to United Kingdom ports and the effect which this has had upon the turnround of the ships concerned. Discharge rates of 14 tons/gang/hr have produced a ship utilization rate of two round trips per week instead of one.

Again, in the handling of cargo to Northern Ireland and Eire, unit loads which have been built up at the end of a factory production line in this country can be carried, intact, including on the ships, through to the wholesale or retail outlet on the other side of the Irish Channel, using regularly, as a standard method industrial trucks both on shore and in the vessels. Savings noted in loading and unloading time are of the order of 50 per cent.

Handling of Specially Long Loads

Notably in the timber and steel industries, the straddle truck is making a marked contribution in terms of productivity and the range of products which this versatile machine can handle is steadily being enlarged. This type of truck, in addition to effecting cost savings, considerably reduces the hazards inherent in handling awkward shaped loads manually or by overhead crane.

Handling in Agriculture

Turning to our home agriculture, already there is evidence that farmers and merchants are finding the benefits of efficient handling by means of industrial trucks. It has recently been reported that a potato merchant storing seed potatoes has made considerable cost savings in the elimination of the potato clamp made of straw and covered with earth, and the introduction of suitably air-conditioned storage of the potatoes in wooden boxes which can be handled by fork lift or pallet trucks.

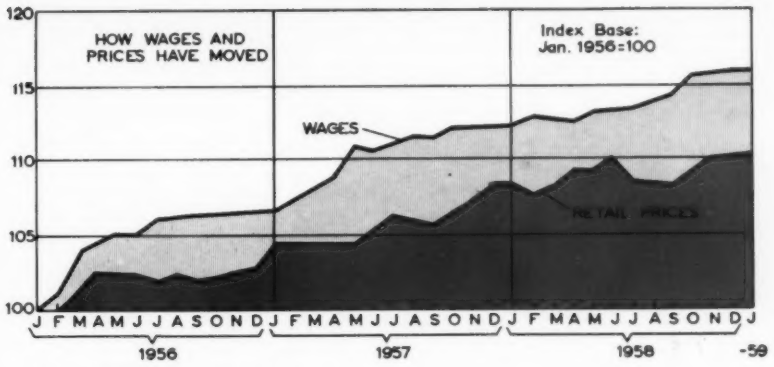


Fig. 2. Movement of wages and prices

Handling in the G.P.O.

During 1957 some 9,700 million letters and 243 million parcels were dealt with, the latter possibly totalling some 500,000 tons in all.

Consider any road, rail, sea or air terminal in Britain (not to mention in every town and village throughout the country), where every day the mail bags are humped and heaved from one form of transport to another. The traditional mail bag was first introduced in 1910 and by now it may be considered to be worthy of review in terms of design and fulfillment of purpose.

What are the basic problems inherent in pioneering a 'packaged unit load' mail handling system in this country? Most letter packages lend themselves to bundling and unitizing, as do a high percentage of the parcels dealt with. Standardization of parcels is clearly impossible, but can this truly be said of the envelope? One or more standard envelopes would open up the way to 'bundling' of mail and 'bundling' would lead to a new mail bag design. For quite different reasons Dartmoor is shortly to be redesigned, but why not its basic product at the same time?

Summary

Clearly the freight handling problem involving the turnround of ships, road vehicles, trains and aircraft can be considerably improved and appreciable cost savings effected if more firms and Government departments adopt a deliberate policy of moving their raw or finished materials on a well-ordered, throughout plan. For example, some firms endorse their orders 'supply on pallets' but, again, how many do *not* do this who could adopt this or some other unitized system?

Certain transport agencies have given a lead by offering the free return of empty standard pallets, yet relatively few firms have taken advantage of this, possibly for the simple reason that they are not geared internally to accept these pallets, or, if they are, because they have not yet considered the possibilities of external pallet handling. It is possibly in this field that the greatest potential exists in terms of the *maximum* contribution to be made by industrial trucks to the British economy.

The appalling demurrage charges accruing to ships delayed in ports and to road or rail vehicles delayed at terminals is enormously high and capable of considerable reduction if industrial trucks were brought in to speed the turnround and release the carrying vessel or vehicle for its revenue-earning role of 'moving things'.

In all the phases of movement the kernel is the cost of lifting and shifting. With the continued rise in our standard of living (and in that of the rest of the world) it follows that the cost of moving things, if performed manually, will continue to increase, often to the detriment of the job being done, to the space we utilize needlessly and to the time we expend clearing bottlenecks, all of which contribute in no small measure to 'pricing' us out of markets overseas. In so many cases, the application of mechanical handling, with particular reference to industrial trucks, can provide the answer.

In effect, to cut the cost of moving things, by now a sizeable factor in the British economy, bold progressive planning is required.

The range of industrial trucks and attachments available for this purpose scarcely knows any bounds. The ingenuity of designers and users alike has helped to put Britain in the forefront of industrial truck design, as is evidenced not only by the home sales but also by the sales overseas of these trucks.

What remains to be done? The British industrial truck will only maintain its place, will only make headway if continued research and development is applied to it in terms of the needs of progressive industry. Industry is going forward in a highly competitive, progressive world, likely to become more competitive. Better, but not necessarily bigger, industrial trucks are required and the measure of this need is the price of £1,300 million which British industry spends annually on wages for moving things.

Conclusion

The various segments comprising the cycle of production and the sectors of our industrial life have been chosen, not quite at random, to illustrate where greater use of industrial trucks can benefit the British economy.

No attempt has been made to analyse particular applications of specific types of truck; rather the thought has been that wherever goods have to be lifted or shifted close examination should be made of the equipment available.

This is basically the task of management which constantly requires to be kept up to date by purveyors of equipment if it is to continue to take a forward looking view of equipment installation and/or replacement.

Part of the answer to this calls for close collaboration between maker and user of the industrial truck, broadly in terms of market research with particular emphasis upon research and development of new equipment to match new processes.

Sound management demands flexibility and safety in its operations and this, combined with bold planning for the future, calls for 'tools to finish the job'.

The industrial truck stands pre-eminently as a 'tool' in any sector of industry which calls for lifting and shifting on the horizontal or vertical plane, and has a vital part to play in benefiting the British economy by BEING WHERE IT IS NEEDED at the RIGHT TIME.

A survey of mobile conveyors and elevators, portable and transportable conveyors, and similar equipment — Part 17

'NON—FIXED' CONVEYORS AND ELEVATORS

by J. M. Beskine, B.Sc.(Eng.)

THE CONVEYOR DEVELOPMENT CENTRE of Fisher & Ludlow, Ltd.'s Mechanical Handling Division is well known to numerous users of modern handling equipment. Here, alongside design and drawing offices, are to be found mock-ups of full-scale handling schemes, ranging from mobile installations to permanent automatically controlled installations. Actually, Fisher & Ludlow do not make a large range of mobile conveyors, but those which they do make are very widely used in manufacturing industry and deserve consideration by all potential users of mobile equipment.

Standard mobile conveyors made by this firm are of two types, Flowcline machines and Flowline machines. These are described elsewhere below. It should be noted that the entire range of Fisher & Ludlow conveying equipment is manufactured in standard assemblies and sub-assemblies, many of which are available in lengths suitable for use where non-fixed conveying lines are required. In addition, mobile telescopic gravity conveyors are also made by Fisher & Ludlow, Ltd.

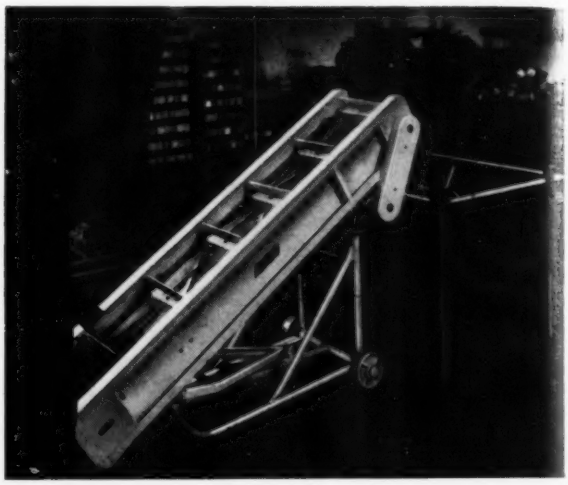
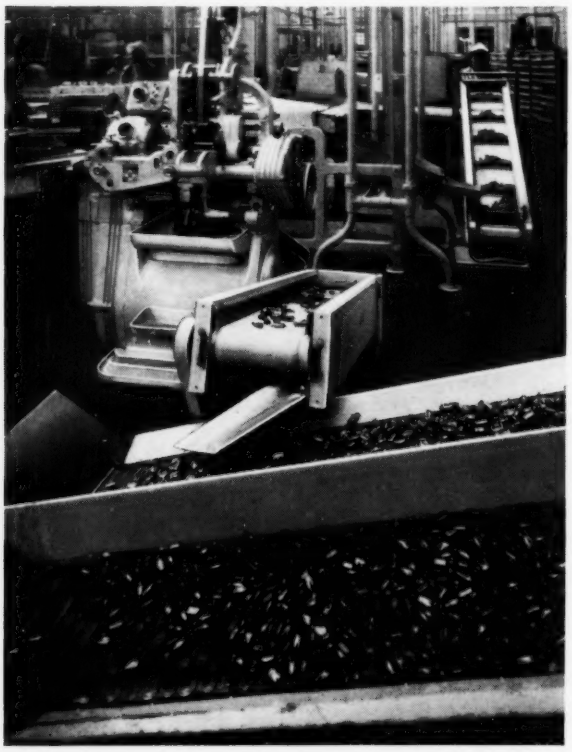


Fig. 156. Flowcline mobile conveyor working between a power press and a box pallet

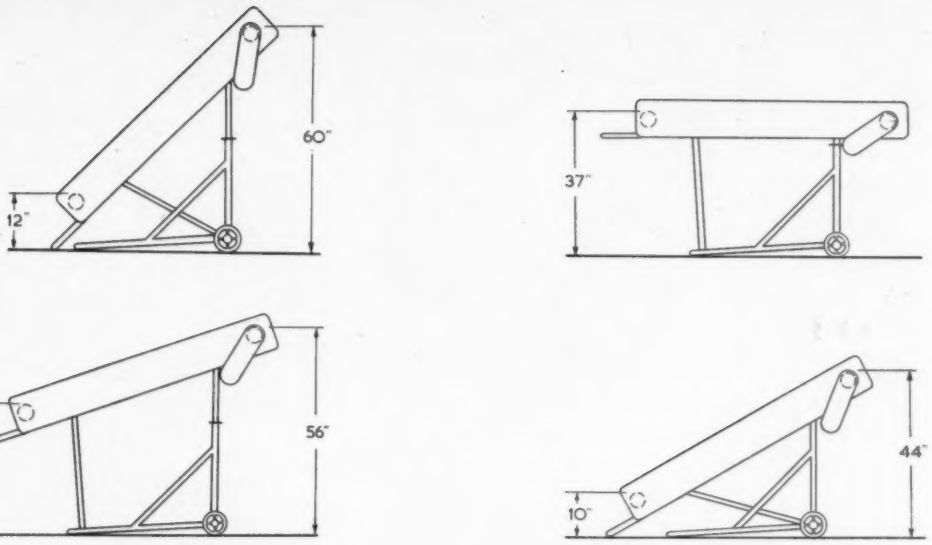
Fig. 157. Flowcline mobile conveyors transporting wrapped confectionery from wrapping machines to wire mesh belt conveyors



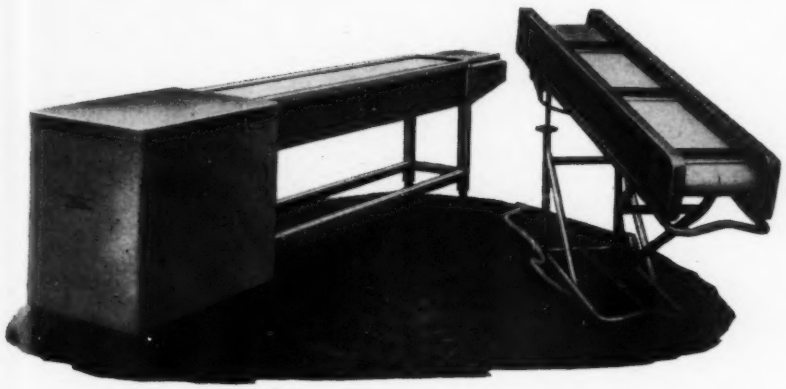
The Flowcline mobile belt conveyor is designed for off-loading machine tools, etc., on to pallets, and for elevating materials to working height for subsequent operations. It is very widely employed within industry for inter-process handling and may be adjusted to operate in a horizontal position or as an inclined conveyor having a variable angle of inclination up to 30 deg, and a variable height above ground level.

Typical examples of application are shown in Figs. 156 and 157, and Fig. 158 shows the loading and discharge heights at four working positions. As may be seen from the photograph, the Flowcline conveyor is constructed from pressed steel members and is highly compact. A 12-in belt of canvas or rubber-and-canvas is employed, and this may be fitted with metal flights. The conveyor is 6 ft long between centres and has a maximum load capacity of 45 lb, with a maximum of 10 lb on each flight. It is driven by a fractional horse-power electric motor which is mounted on the underside (so as not to restrict the height of articles handled), belt speed being 65 ft/min.

The conveyor is mounted within a light tubular frame and is rendered mobile by means of front-mounted wheels. It is easily moved from point to point, as it is a well-balanced machine and weighs only 2 cwt. The discharge end may be raised or lowered by a pair of screw-adjustments. The working height above ground level being adjusted by means of a pin-secured adjusting lever arm. When in the horizontal position the conveyor is 37 in above ground level. It may be inclined at 30 deg by moving the adjusting lever to the most forward position, when the loading height becomes



ABOVE
Fig. 158. Loading and discharge heights of Flowcline mobile conveyor, for four different working positions



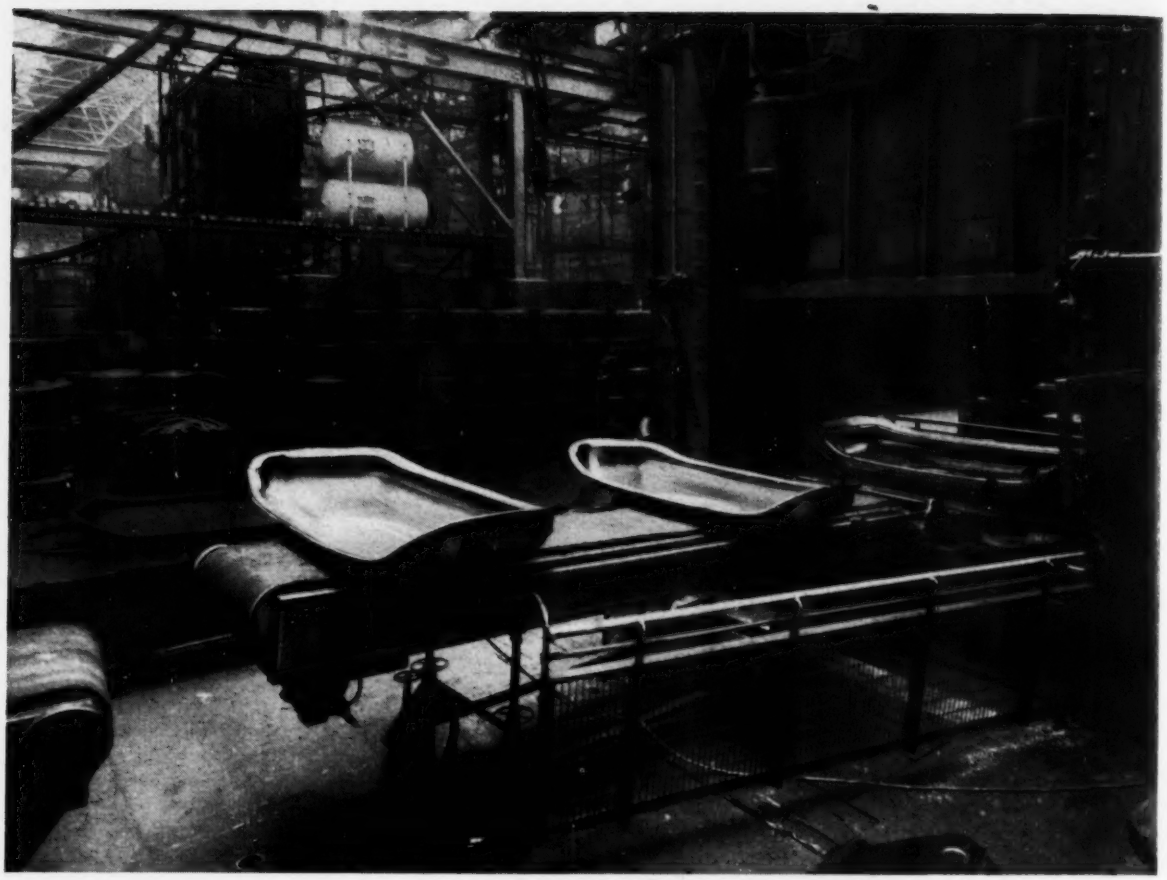
LEFT
Fig. 159. Two types of mobile conveyor, a Flowcline mobile conveyor with variable height and variable inclination (right), and Flowline mobile horizontal belt conveyor (left)

BELOW
Fig. 160. Dual-directional press component or scrap removal mobile conveyor

reduced to 10 in, and the discharge increased to 44 in. The discharge height can be further increased to a maximum of 60 in, by operation of the adjusting screws, the corresponding loading height being 12 in. For most applications, however, it is usual to arrange the delivery feed to the conveyor to cover a considerable proportion of its length, hopper fashion.

The application of a Flowcline conveyor to press shop use is shown in Fig. 156. Here work pieces are being transported from the press on the left, to the bin-type pallet on the right. Another application is shown in Fig. 157. Here confectionery is being conveyed from wrapping machines on to wire mesh belt conveyors. The main point to note about such applications is that by using a standard machine such as the Flowcline conveyor, inter-process handling in manufacturing industry may be carried out with a minimum of trouble and a maximum of flexibility.

Other types of Fisher & Ludlow mobile conveyor and mobile conveyor applications are shown in Figs. 159, 160 and 161. Fig. 159 shows a Flowline mobile horizontal belt (left) alongside a Flowcline machine (right). Fig. 160 shows a mobile dual-directional press component or scrap removal conveyor, which consists of an inclined portion fed by a horizontal section, both being driven from a common shaft.



The illustration shows a blank press discharging components which are then elevated and discharged into a skip, for transfer to a subsequent operation or to the stores. Fig. 161 shows another type of Fisher & Ludlow mobile conveyor being employed for inter-press handling. In this case the conveyor is mounted on castors and has semi-fixed securing feet. It can be inclined forward or aft. The conveyor is of interest because of its ability to feed or remove panels irrespective of whether the press in question has automatic ejection or manual assistance. Conveyors of this type may easily be used in series, as when organizing line production between major press units.

ABOVE
Fig. 161. *Mobile conveyor as used for inter-press handling*

BELOW
Fig. 162. *Fisholow mobile telescopic gravity conveyor, showing discharge end within a motor vehicle*

BELOW RIGHT
Fig. 163. *The mobile telescopic gravity roller conveyor shown in Fig.* 162, *looking towards loading end in dispatch bay*

THE INDUSTRIAL FORDSON POWER MAJOR TRACTOR

FEATURES INCLUDE LIVE POWER TAKE-OFF AND LIVE HYDRAULICS

by T. W. Highgate

SOME TIME AGO the well known Fordson Major tractor went out of production and was immediately superseded by a new model which is now in full production and is being marketed as the 'Fordson Power Major' tractor. Externally, few changes are to be seen, except in instrument panel layout and throttle lever position. Actually, important improvements have been made in engine design and performance and in hydraulic control. The new tractor has a brake-horsepower output of 51·8 b.h.p. at 1,600 r.p.m. and is designed to handle heavier loadings when operating with towed or stationary mechanically or hydraulically driven earthmoving and industrial equipment.

'Fordson Power Major' skidded units have replaced 'Fordson Major' skidded units for the construction of loaders, shovels, cranes, dozers, trench-diggers, graders, air-compressors, road-rollers, fork lift trucks, and other equipment. The increased power capacity of machines based on 'Power Major' units have already proved valuable to manufacturers and buyers alike—mobile loaders and other machines of increased capacity have strengthened Britain's position on the home and export machinery markets, and users will be able to get more work out of machines per ton weight and per pound sterling or dollar of capital expenditure.

Output of 'Fordson Power Major' tractors and skidded units is expected vastly to exceed output of 'Fordson Major' tractors and units, of which well over a quarter-million tractors were produced since 1951—70 per cent for export. During the year 1958 Fordson tractor manufacturing capacity was in fact practically doubled. This increased capacity being used for 'Fordson Power Major' tractors and 'Fordson Dexta' tractors, 16,000 of which have been made since February, 1958. During recent years important expansion schemes have been initiated by tractor manufacturers in Britain and elsewhere in Europe, and Ford now claim to be once again the largest manufacturers of tractors in Europe. They also claim to be the largest exporters of wheeled tractors in the world. Many of these tractors are, of course, for agricultural use, but a growing stream of machines is going into industry and into building and civil engineering contracting.

Fig. 1. Fordson 'Power Major' tractor pulling a mole drainer

Five Main Improvements

Comparison of the 'Fordson Power Major' and the 'Fordson Major' tractors, shows that five main improvements have been made. These are as follows:—

1. The 'Fordson' diesel engine has been increased in output capacity and its good fuel economy characteristics maintained. It now develops 51·8 b.h.p. at 1,600 r.p.m. (bare engine), which may be compared with the N.I.A.E. test of the Fordson Major in 1952, which showed the belt horsepower to be 37·7, an equivalent of 41 b.h.p. In other words output capacity has been increased by over 10 b.h.p. at the same engine speed and for the same fuel economy. This increased output has been achieved without enlarging the engine, mainly by alterations to the rocker arms, the camshaft, the cylinder head, and the fuel injection system. A larger air cleaner has been fitted to cope with the increased air consumption.

2. To take care of the extra power, the transmission has been strengthened and modifications have been made to the differential and power-take-off drive. For example, the differential now incorporates revacycle pinions, and the power take-off drive is now carried throughout on ball and needle roller bearings.

3. The hydraulic valve gear has been improved by replacing the unloading valve used on the Fordson Major by a relief valve which reseats immediately with a slight fall in pressure.

4. Scalloped rear wheels are now fitted. These reduce effort when adjusting wheel track by eliminating the necessity for removing the disc completely when making certain changes. This improvement is of importance mainly in its agricultural applications, but is of some interest for certain earthmoving applications as well.

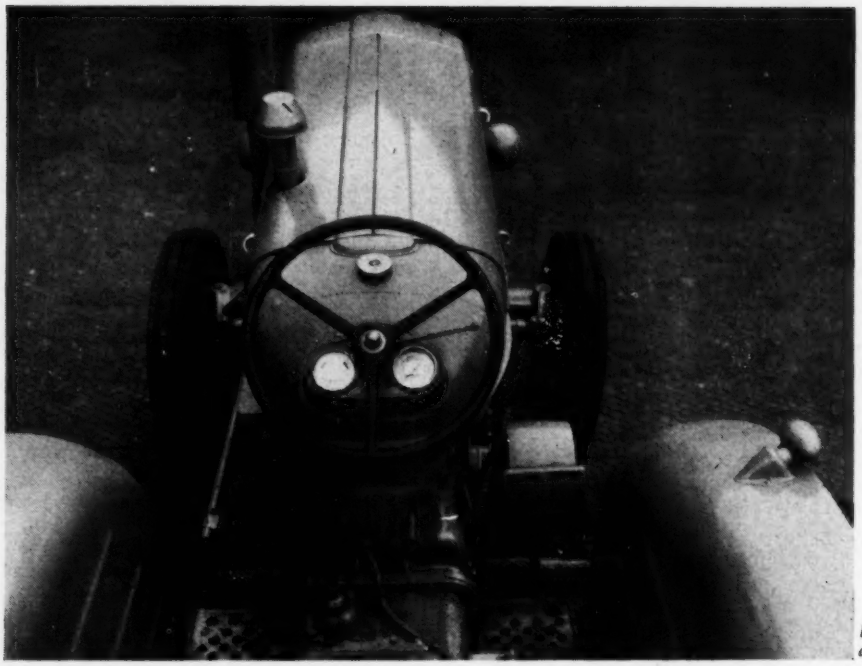


Fig. 2. Details of instrument cluster and throttle-lever position

5. The instrument panel and controls have been re-grouped. The instrument panel is now on top of the tank and below the steering wheel, in full view of the driver. The proofmeter is incorporated in the new cluster and is illuminated when the lights are switched on. This instrument has an extra band in black, to indicate road speed for fourth gear. The throttle lever is now located under the steering wheel and this enables the operator to exert finger-tip control, whilst retaining both hands for steering.

The new tractor is now available with live power-take-off and live hydraulics. One pedal operation does two things, it stops the tractor and the power-take-off. Other optional equipment includes the following: belt pulley, standard or raised power take-off and guard, exhauster unit, automatic hitch, heavy-duty rear axle, power assisted steering, dual rear wheels, alternative tyre sizes. Standard equipment includes: six-speed transmission, electric starting, horizontal or vertical exhaust, proofmeter, electric lighting and horn, handbrake, swinging drawbar, and new 'comfort seat'.

An indication of the new tractor's performance can be obtained from drawbar tests on wet grass, carried out by hitching a wheeled 'Fordson Power Major' tractor to a County 'Ploughman' crawler tractor, back to back, with a dynamometer in between. This gave a drawbar test reading of more than 4,500 lb, for a diesel tractor weighing about 5,200 lb. Under ideal conditions very much higher drawbar pulls would be obtained.

Crawler tractors based on Fordson engines and transmissions, are now being equipped with 'Fordson Power Major' skidded units. Details of these machines will be given in *Mechanical Handling* as they become available.

Specification Details

The specification details for the 'Fordson Power Major' tractor are given below. Travel speeds are shown in Table 1. (See page 347)

Front Axle: Pivoted three-piece construction. Track adjustment: 50½ in—74½ in; in 4-in steps.

Engine: 4-cylinder diesel or petrol. Bore: 3.937 in (diesel), 3·74 in (petrol). Stroke: 4·524 in. Capacity: 220 cu. in. (diesel), 199 cu. in. (petrol). Compression ratio: 16·1 : 1 (diesel), 5·5 : 1 (petrol). Firing order: 1-2-4-3. Maximum power delivered by engine, less ancillary equipment, 51·8 b.h.p. at 1,600 r.p.m.

Clutch: Standard, single-plate dry; diameter, 11 in area; 124 sq. in. Number of springs, 9.

Double for live p.t.o.; double-plate dry; diameter, 12 in.; total friction area, 126 sq. in. each disc; number of springs, 12.

Transmission: Six-speed constant mesh. Overall ratios: 1st gear, 123 : 1; 2nd gear, 87·3 : 1; 3rd gear, 68·4 : 1; 4th gear, 48·6 : 1; 5th gear, 34·8 : 1; 6th gear, 19·4 : 1; High rev. 50·7 : 1; Low rev. 91·1 : 1. Road speeds, m.p.h. at 1,600 r.p.m.—standard tyres: 1st gear, 2·07; 2nd gear, 2·92; 3rd gear, 3·73; 4th gear, 5·25; 5th gear, 7·32; 6th gear, 13·16; high rev. 5·03; low rev. 2·80.

Power take off: Rear end. Speed: 542 r.p.m. at 1,200 engine r.p.m. standard; 540 r.p.m. at 1,600 engine r.p.m. raised. Diameter 1⅜-in six-spline. Height from ground, standard tyres, 20½ in standard; 25½ in raised. Distance from end of shaft to rear axle centreline: 15·9 in standard, 18·9 in raised.

Belt pulley: R.H. side of tractor. Diameter, 8½ in; width, 6⅜ in; pulley speed, 1,400 and 779 r.p.m. at 1,400 engine r.p.m.; belt speed, 3,115 and 1,734 ft/min at 1,400 engine r.p.m.

Hydraulic Power Lift: gear-type pump transmission: speed, 744 r.p.m. at 1,400 engine r.p.m.; capacity, (94 per cent efficiency), 4·06 g.p.m. at 1,400 engine r.p.m. *Ram Cylinder:* Single-acting; Bore, 2⅞ in; Stroke, 5¼ in. *Linkage:* British Standard, category 2, three-point.

Swinging Drawbar: Height from ground to top of clevis (standard tyres): 13·62 in, 16·50 in, or 19·38 in. Distance

Fig. 3. Scalloped rear wheels

from pin hole to end of P.T.O. shaft, 17 in. Diameter of pin hole, $1\frac{1}{16}$ in. Lateral adjustment, 12 in. each side of tractor centreline.

Rear Axle: Semi-floating with four-pinion differential. Gear ratio: bevel reduction, 3·5 : 1; spur reduction 5·308 : 1; total reduction, 18·577 : 1. Track adjustment: 52 in—72 in in 4-in steps; for 13-30 and 14-30 tyres, track is fixed at 58 in.

Brakes: Mechanical internal expanding, mounted on bull pinion shafts, each side operated independently or together. Drum diameter, 10 in; shoe width, $1\frac{3}{4}$ in; area per shoe, 16·8 sq. in. Locking means for parking, by ratchet after latching pedals together.

Rear Wheel Weights: Three 100 lb units to each wheel.

Steering: Single drop-arm recirculatory ball. Gear ratio 24·12 : 1. Steering wheel diameter, 18 in. Turning circle, 27 ft 9 in, 23 ft 3 in with brakes.

Cooling System: Thermo-syphon and centrifugal pump. Fan size, 2 blade 17 in dia. Temperature control by thermostat.

Electrical: Battery. Voltage, 2-6 volt = 12 volt. Capacity, 129 Ah at 10 hr rate. Location, between engine and fuel tank. Lucas generator, shunt wound, drive by belt from crankshaft pulley. Regulation, C.V.C. max charging rate, 14 A. *Starter Motor*: Lucas, pre-engaged, manually operated.

Dimensions: Overall length, $130\frac{1}{2}$ in. Overall width, 65 in (min. track). Overall height to hood line, $57\frac{3}{8}$ in; to steering wheel, 63 in; to vertical exhaust 79 in. Ground clearance, front axle, $19\frac{1}{2}$ in; engine, $20\frac{1}{2}$ in; transmission, 16 in; rear axle, 23 in; drawbar, $12\frac{3}{4}$ in. Wheelbase, 80 in.

Weight: Standard tractor, 4,600 lb (diesel), 4,540 lb. (petrol). Tractor with H.P.L., P.T.O. and belt pulley, 5,200 lb (diesel), 5,140 lb (petrol).

Capacities: Engine sump, 12 pints. Front transmission. 36 pints. Rear transmission, 72 pints. Fuel tank, $14\frac{1}{2}$ gallons,

Table 1. Forward and Reverse Travel Speeds

Gear	Overall ratio	Speed, m.p.h.		
		1,200 r.p.m.	1,400 r.p.m.	1,600 r.p.m.
1st	123	1·56	1·82	2·07
2nd	87·3	2·19	2·56	2·92
3rd	68·4	2·80	3·26	3·73
4th	48·6	3·94	4·59	5·25
5th	34·8	5·49	6·41	7·32
6th	19·4	9·87	11·52	13·16
High reverse	50·7	3·77	4·40	5·03
Low reverse	91·1	2·10	2·45	2·80

These speeds are calculated for 11-36 and 14-30 tyres

Fig. 4. General appearance of the new tractor

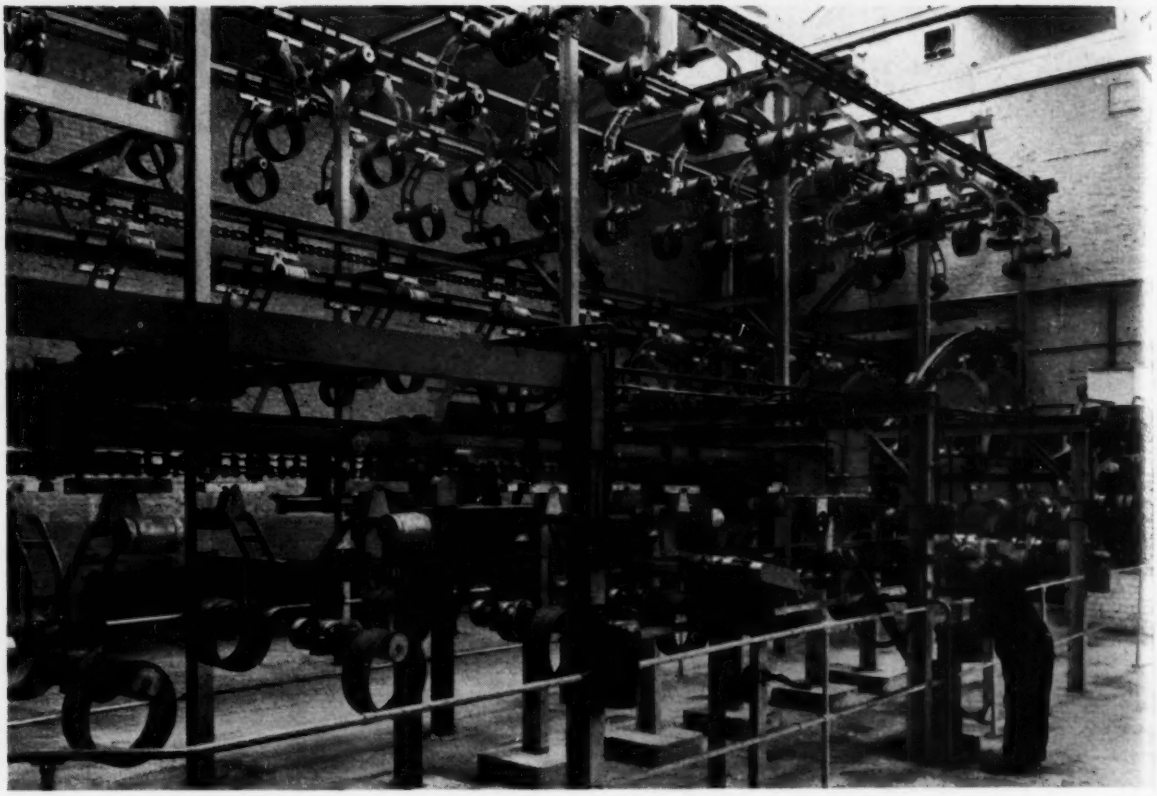


Fig. 1. Cement application plant where bands for vulcanite bonding are prepared

MECHANIZATION IN SOLID-TYRE MANUFACTURE

W. E. DUNKLEY*

IN A RECENT article, 'Present-day Uses for Solid Tyres' (October issue *Mechanical Handling*), reference was made to the fact that the increasing demand brought about by the requirements of fork lift trucks had led the Dunlop company to mechanizing the solid-tyre plant at their Manchester factory. An interesting point is that this highly mechanized plant is manufacturing one of the oldest products in the rubber industry.

Solid-tyre manufacture involves rather more than a series of mechanical operations and requires chemical, manual and mechanical processes. The series of processes can be divided up into three main groups: (1) preparation of the steel band; (2) preparation of the rubber tread; (3) bonding of the tread to the steel band.

Preparing the Steel Bands

The steel bands are manufactured to a special steel specification at the Dunlop rim and wheel factory in Coventry and delivered to Manchester in a clean machined condition. They are then stacked neatly in the factory according to type and size, ready for processing in preparation for bonding. Bonding is achieved in two different ways: one method is by direct bonding, the other is by vulcanite bonding. If a band is intended for vulcanite bonding it has machined grooves and serrations around its circumference, but if it is to be used for the direct bonding process it has a plain machined surface.

When preparation begins, the bands are immersed in a tank containing a chemical degreasing agent and are allowed to soak for a short period. On removal they are placed on an overhead conveyor, which carries them to the shotblasting machine that exposes a clean but slightly pitted surface. The shotblasting machine automatically stops the conveyor at every band by means of a process timing mechanism and carries out the required period of blasting to suit the particular diameter of the band. Preparation of the steel bands for vulcanite bonding differs from that of direct bonding and therefore this conveyor is used alternatively for each type.

Preparation for Vulcanite Bonding

The same conveyor carries the bands for vulcanite bonding to the cement application plant, which is once again automatic and self-adjusting to size. The vulcanite cement is applied by guide plates and brushes while a small roller is

* Dunlop Rubber Co., Ltd.

the machine rotates the band on the conveyor arm, the cement being evenly spread in the grooves and serrations. This cement contains solvents which need to be evaporated before rubber bonding can take place.

This evaporation process takes a considerable time, and before the factory was fully mechanized all the steel bands awaiting evaporation had to be stacked on the shop floor. Now the bands are left on the conveyor, which is two tiers high and more than 400 ft long. The conveyor speed is synchronized with the process to ensure that the specified length of time elapses between the application of the cement (Fig. 1) and the moment at which the band leaves the shop.

The Treadbase Assembly Line

The prepared band is now placed on another conveyor which forms the treadbase† assembly line. It is a chain conveyor moving at bench level through various processing operations. The treadbase is prepared and cut to length; it is then stored by the side of the assembly line.

The first operation on the assembly line is the hand fitting of the treadbase. This is simply wrapped round the circumference of the band, and a good level bevelled joint is achieved. The band and tread-base assembly, still on the conveyor arm, is then pressure-rolled and serrated automatically, and proceeds on the conveyor arm to a point where it meets another conveyor carrying the actual tyre treads.

Preparation for Direct Bonding

As with the vulcanite process, the bands for direct bonding are chemically degreased and shotblasted. They then undergo a special cement application and after a waiting period (on the moving conveyor) are ready for actual tread fitting.

Preparation of the Tread

Rubber compound is delivered to the factory in bulk, and each batch is chemically and physically tested to determine its quality. After being carefully blended with other compound batches to achieve the desired uniformity, it is passed through a breaker consisting of two fluted steel rotors having a diameter of 15 in and a length of 20 in, which turn in opposite directions. This process breaks down or softens the compound, after which it is transferred by a 12-in belt conveyor to the warming-up mill, comprising two plain steel rotors of 2 ft dia and 7 ft in length.

In passing between these rotors, the rubber is further softened and its temperature is increased. On reaching a specified temperature, it is passed on by a 12-in belt conveyor to the next process, which is tread extrusion.

Tread Extrusion

The extruder holds 75 lb of compound and will work continually from a constant feed of the material. Inside the extruder is a worm rotor which continually feeds the soft compound under high pressure towards the frontal chamber and die orifice.

The tread dies are made of tool steel plate and vary in size according to the thickness and contours of the tread required. Tread extrusion has to be very carefully controlled to achieve an accurate predetermined weight per unit length (Fig. 2).

Tread Cutting

The tread leaving the extruder is forced up a short roller conveyor on to a belt conveyor which runs underneath the automatic flying strip cutter. This machine travels on a carriage above the belt conveyor and is controlled electronically through signals received from a batch counter, into which information regarding the required length and cutting angle has been fed.

Fig. 2. Tread strip leaves the extruder (left) and is cut accurately to length by the flying strip cutter (centre). On the same conveyor it is weighed and automatically rasped before it meets the prepared steel band on the extreme right

The rubber is cut by a rotating steel blade, at an angle which is varied automatically. Each tread strip is cut at two different angles to achieve a neat bevelled tread joint and a smooth circumferential tread surface. After cutting, the treads pass on to a semi-circular roller conveyor where they are automatically weighed. An operator rejects any treads that are not within a tolerance of approximately 1 per cent. Rejects are sent back to the cracker on an overhead return conveyor.

If the tread is within tolerance it is passed to a conveyor lying only a few inches above the treadbase assembly line. On this conveyor the bevelled surfaces of the tread ends are rasped (Fig. 3) to produce a roughened surface and assist adhesion when the tread is joined.

Fitting and Bonding the Tread

The tread is now fully prepared and ready to meet the steel band on which it is to be fitted. From the last process the tread moves on a gravity roller conveyor to a point where it meets the treadbase assembly line conveyor. Here the warm tread is fitted by hand to the prepared steel band.

The joint is made and secured by an operation called *pegging*, which is done with a circular-bladed hand instrument that splices the tread at the bevelled joint. After hand trimming, the tyre is placed on one of the three overhead chain conveyors, which feeds it directly to the moulding shop. All three of these conveyors are usually fully loaded with tyres of all sizes. Once again the tyres are deliberately left on the conveyors for 3-4 hr before passing on to the moulding process. This allows the fitted tread to settle down on the rim.

Tyre Moulding

Moulding and vulcanization are carried out simultaneously in a highly critical process that requires specialist experience, particularly when different rubber compounds are being used, each of which has its own special vulcanizing requirements.

First a steel mould core is machine-pressed into the centre of the steel tyre band. This core locates the tyre in the actual mould, which is split horizontally into halves. The tyre

† The treadbase is not the actual tread, but a thin undertread of uncured vulcanite approximately $\frac{1}{16}$ in in thickness, which forms a bonding medium between the prepared band and the actual tread which is fitted later.

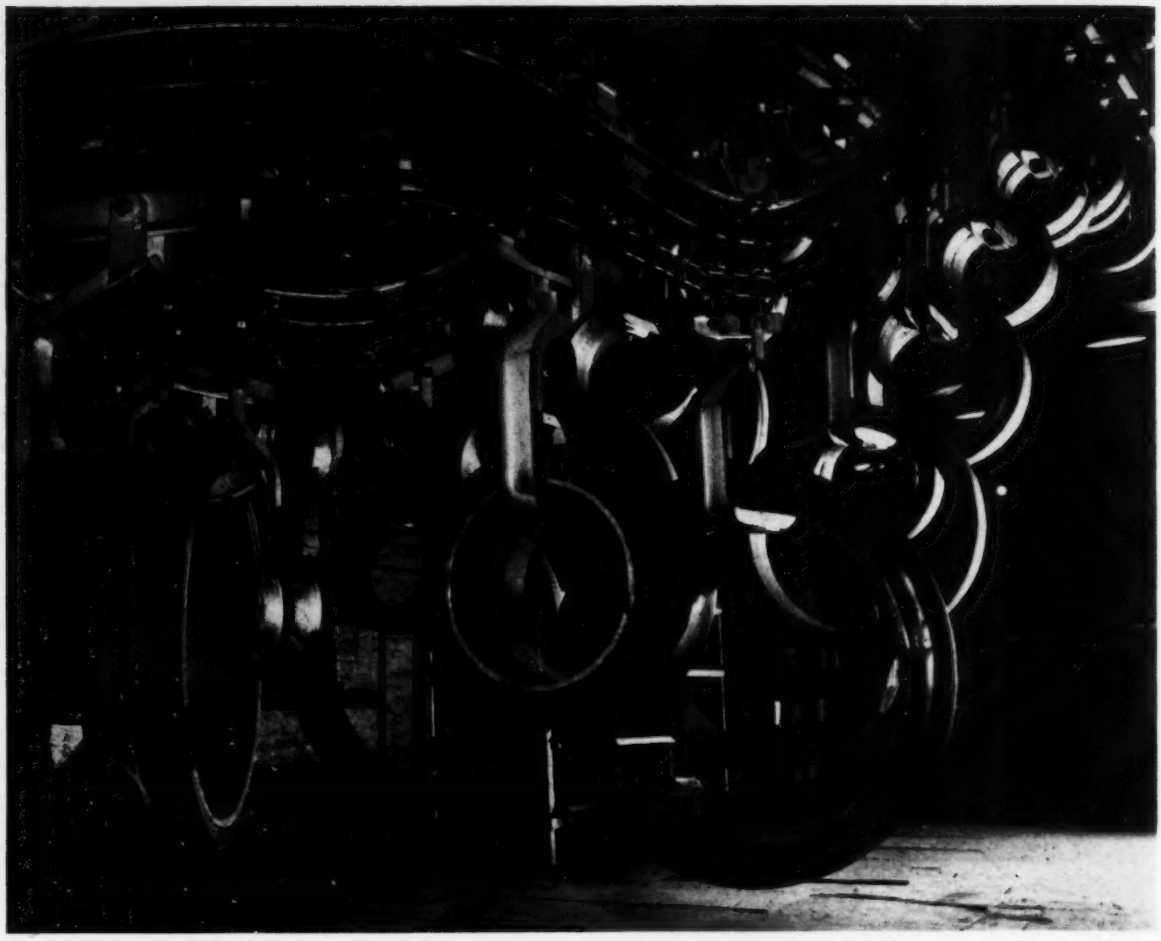


Fig. 4. After the treads have been fitted, assemblies of all sizes are placed on an overhead conveyor system which carries them through to the moulding section

Fig. 3. The tread conveyor meets the band conveyor and the tread is hand-fitted

and core are located on the bottom half of the mould and the top half is then put in position. The mould, with six or eight others, is then placed in a steam-heated autoclave where it remains for a specific period of time at a temperature that is varied to suit the rubber compound being used.

During moulding the rubber expands slightly, and excess rubber is pushed out at the joint between the halves of the mould. When the tyre is removed from the mould, this excess rubber, or *spew*, is trimmed off, after which the tyre is finally viewed and physically tested before despatch (Fig. 4).

The Significance of Mechanization

The advantages gained by mechanizing the processes of solid-tyre manufacture are clear enough. Most of the operations referred to are actually carried out with the product on a conveyor arm. Overhead chain conveyors have not only provided an efficient means of transportation between processes but have also been used effectively to provide storage space during maturing or waiting periods. This has enabled full use to be made of all available factory space and at the same time has avoided damage or distortion to the product in its soft unvulcanized state. Man-handling is reduced to the minimum and accidents are therefore rare.

The factory produces 140 different sizes and types of solid tyres, usually handling more than three dozen different sizes and types at any one time. The demand for solid tyres continues to increase, but the new plant is designed so that it can accommodate all production requirements that are likely to arise in the near future.

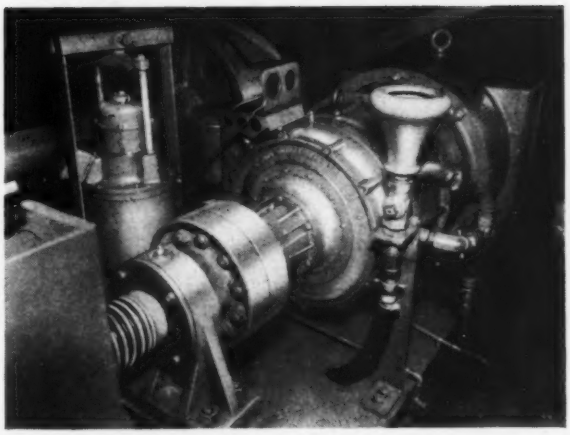
Henderson 15-ton Multi-Motor Derrick Cranes Fitted With Torque Converters

THE 15-ton multi-motor derrick cranes illustrated in Fig. 1 were supplied by John M. Henderson & Co., Ltd., to Sir Robert McAlpine & Sons, Ltd., and are being used for the construction of the new Shell building on the South Bank. These cranes are of special interest, for this is the first time that derrick cranes operating in Great Britain have been equipped with hydraulic torque converters.

The torque converter is incorporated in the hoist motion drive for the purpose of obtaining automatically infinite speed variation, inverse ratio to the load handled on the hook. Speeds up to 60 ft/min are attainable when handling 15-ton loads, and up to 225 ft/min when handling loads of 4 ton. Corresponding speeds can be reached for loads between 4 and 15 ton, and lighter loads can be lifted at higher speeds. All loads up to the maximum can be lowered at varying speeds, and lowering can be controlled down to inching speeds.

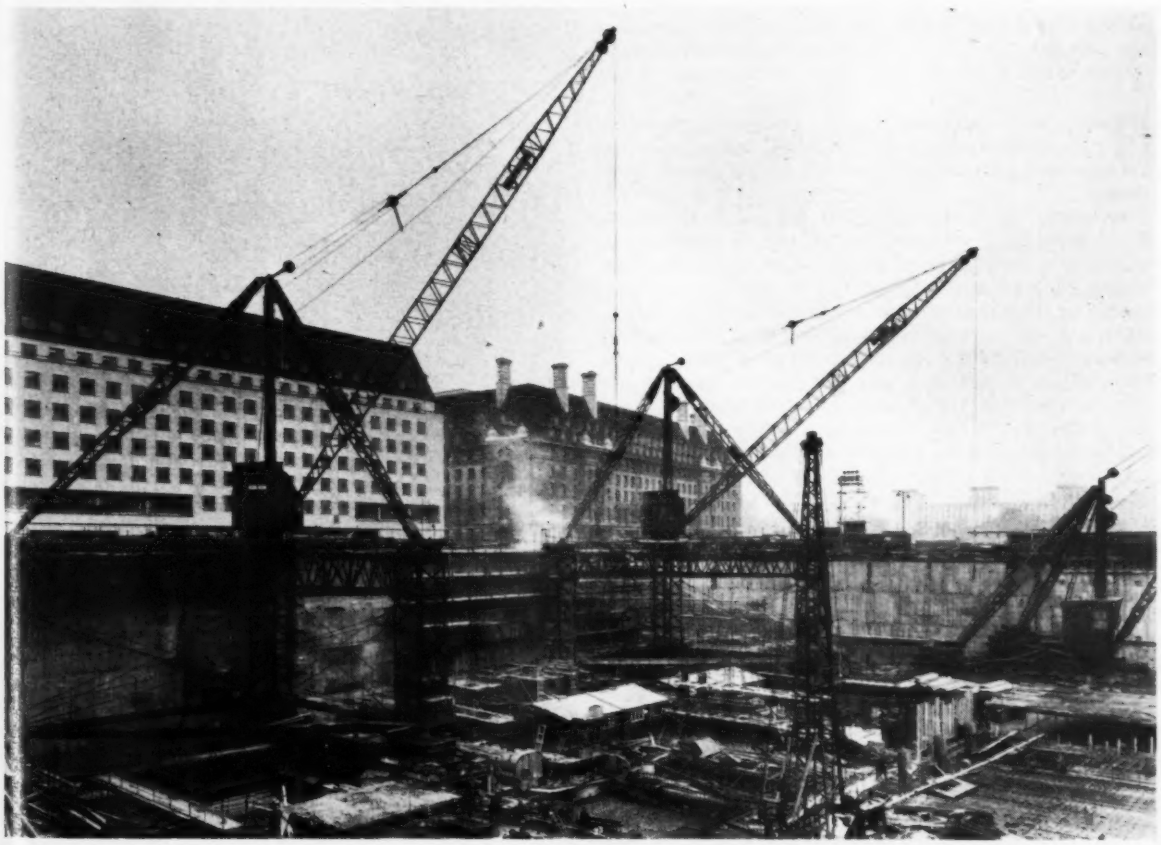
The hoisting and lowering motions are controlled by a master controller and contactor panel. The derricking motion is driven by a separate motor and is arranged for counter-current braking.

The two photographs show in one case an excellent close-up photograph of the torque convertor mechanism, while the other view shows the multi-motor derrick crane in operation.



ABOVE
Fig. 2. Hoist-motion drive incorporating torque converter

BELOW
Fig. 1. Derrick cranes fitted with torque converters on the South Bank site of the new Shell building



SURVEY OF EXHIBITIONS

Several exhibitions have been held, or are about to take place, of interest to readers of this journal. In the following pages brief previews or reviews (as the case might be) are given of the following:

International Plastics Exhibition
Engineering, Marine, Welding and Nuclear Energy Exhibition
Swiss Exhibition (Basle)
British Trade Fair, Lisbon

BRITISH TRADE FAIR, LISBON
29th May—14th June, 1959

This Trade Fair will be the largest foreign exhibition ever held in Portugal. Products of more than 500 firms will be displayed and the Engineering Section is expected to play a prominent part. The following notes are a very brief indication of the type of equipment to be shown of interest to readers of this journal.

HENRY M. F. HATHERLEY, LTDA., are distributors in Portugal for E. Boydell & Co., Ltd., Manchester, and will be showing a range of Muir-Hill dumpers, loaders and shunters.

Associated Electrical Industries, Ltd., will display, or show by illustration, products of the A.E.I. Turbine-Generator and Heavy Plant Divisions and A.E.I.-John Thompson Nuclear Energy Co., Ltd., will also have an exhibit on the stand.

Lamson Engineering Co., Ltd. On show at this stand will be a single-lane 'V' trough conveyor with a 90-deg corner. The right-angle bend is a new development and opens a wider field for this type of conveyor. Tickets, cards, forms, etc., are carried on edge resting on a moving belt and any number of lanes can be supplied of any length. Each lane can be used for a different class of document, a different processing or direction. A number of multi-lane conveyors are in use in airline ticket reservation centres and are, in some cases, raising the handling efficiency by 90 per cent or more.

Also on the stand will be a continuous circuit transparent tube system which will be powered by one of the new Cabinet Juniors. A further Cabinet Junior will be used to give communication between the other three adjacent stands which make up the Lamson Industries Group display. The tubing used in this system will be in grey plastic.

To give some idea of the range of tube sizes manufactured by Lamson Engineering Co., Ltd., there will be a display of tubing and the appropriate carriers, including the now well-known pre-selector system by which carriers can be automatically sent to any chosen station by simply dialling a combination of electrical contact bands on the carrier before inserting it into the system.

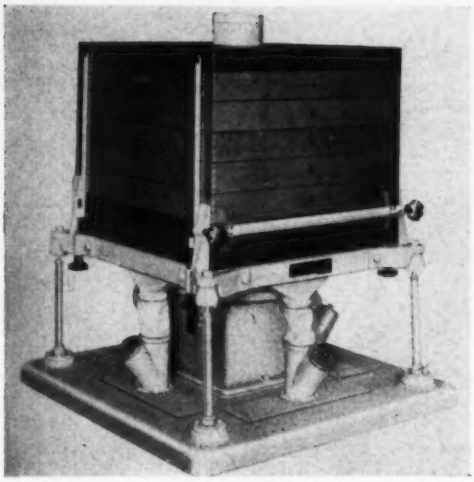
One of the tractors to be exhibited by International Harvester Co. of Great Britain, Ltd.

British Insulated Callender's Cables, Ltd., and British Insulated Callender's Construction Co., Ltd.—members of the B.I.C.C. Group—are displaying some of the products of their cable factories and are illustrating their construction activities.

'Diamond H' Switches, Ltd., London, W.4, are showing a selection from their range of switches and thermostats.

Euclid (Great Britain), Ltd., are exhibiting two types of Euclid units on the stand of Blackwood Hodge (Portugal) Lda.

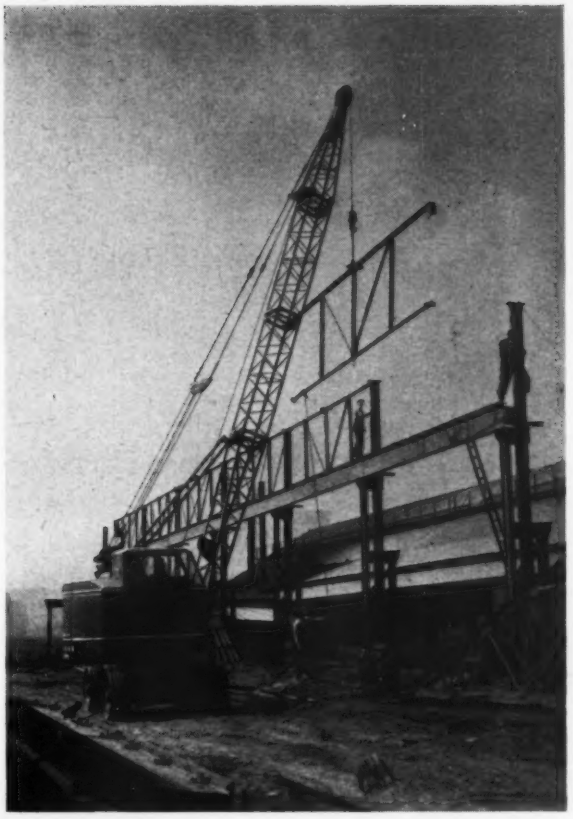
Renold Chains, Ltd., of Manchester, will be exhibiting on the stand of their Portuguese representatives, Harker



ABOVE
The compact Robinson sifting machine for powdered and granulated materials, known as the Minisifter, which will be exhibited at the British Trade Fair, Lisbon. Although the unit occupies a space only 4 ft × 4 ft it has an effective sieving area of up to 54 sq. ft. (*Thomas Robinson & Son, Ltd., Rochdale*)

A Massey-Ferguson tractor '65' to be exhibited by Massey-Ferguson (G.B.), Ltd.

BELOW
One of Britain's latest tractors, The David Brown 950 with David Brown Albion 'Hurricane' forage harvester, both of which will be exhibited at Lisbon



One of the Jones mobile cranes to be exhibited by K. & L. Steelfounders & Engineers, Ltd.

Sumner & Ca., Ltda. (Stand No. A8), a comprehensive selection of their precision roller chains (B.S. and A.S.A. series), conveyor chains and the Coventry Mark 5 chains (malleable replacement series).

R. A. Lister & Co., Ltd., from whose factory at Dursley in Gloucestershire emerge a number of engineering and agricultural products of which diesel engines are best known in Portugal. Representatives of the company will man the stand with two Portuguese concerns for many years associated with R. A. Lister & Co., Ltd. They are Metalurgica Duarte Ferreira S.A.R.L. of Lisbon and Pinto & Cruz of Oporto.

The General Electric Co., Ltd., will exhibit through their agents, The Engineering Company of Portugal, Ltd., mercury arc rectifiers, silicon rectifiers and electrical equipment for rolling-stock.

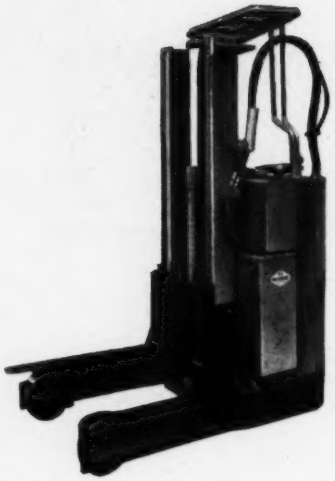
Blandy Bros., Lda., Lisbon, will be exhibiting rock drills and paving breakers, manufactured by Armstrong Whitworth & Co. (Pneumatic Tools), Ltd.

The English Electric Co., Ltd., whose stand is situated near the main entrance, will illustrate by displays and models its recent achievements on land, sea and air. One of the exhibits will symbolize the company's work all over the world in major hydro-electric power schemes.

Messrs. Socoem, Sociedade Comercial de Maquinas, Ltda., Lisbon, are exhibiting a range of Chaseside Engineering Co., Ltd., products. The accompanying illustration shows a Chaseside Loadmaster '800 TC'.

Rotary Hoes, Ltd., manufacturers of the Howard Rotavator, through their agents, Fassio Ltda., Lisbon, are displaying examples of the Howard E Series of Selectatilth.

One of the Conveyancer TC models to be exhibited by Conveyancer Fork Trucks, Ltd.



Conveyancer reach truck exhibited by Conveyancer Fork Trucks, Ltd.

Chaseside Loadmaster

A Road Mac 1 dumper manufactured by Road Machines (Drayton), Ltd., on the stand of their distributors E., Pinto Basto & Co., Ltd.

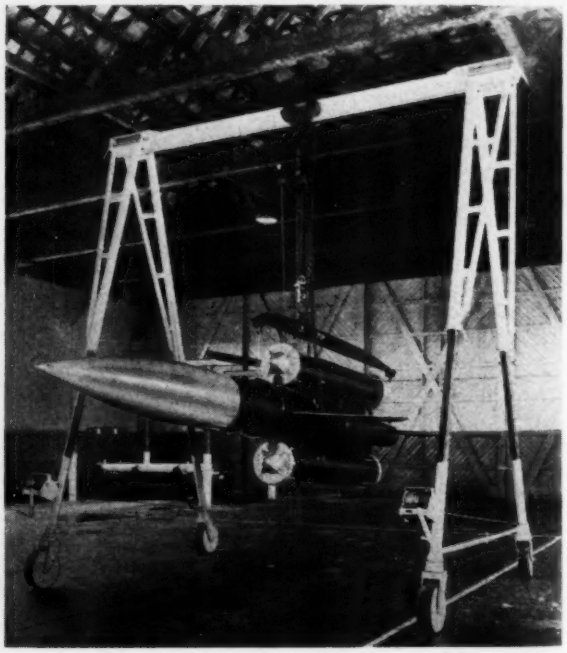
Pollard Bearings, Ltd., through their agents, Frederico C. V. Costa, Apartado 428, Lisbon, 2, will be showing a wide range of the bearings which they manufacture.

Ransomes & Rapier, Ltd., will exhibit their machines on the stand of their agents, Blandy Bros., Lda.

Guest Keen & Nettlefolds will exhibit the general activities of the group and some of these will be shown photographically and some with physical exhibits.

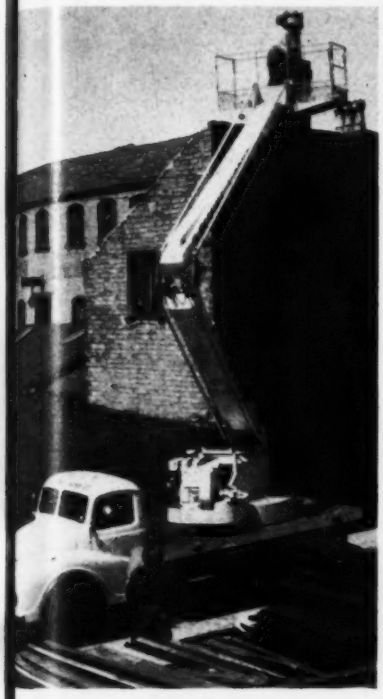
Herbert Morris, Ltd., are showing a range of their lifting tackle on the stand of their agents, The Engineering Company of Portugal, Ltd.

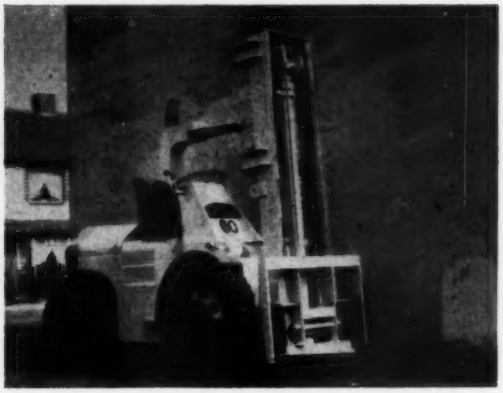
3-ton 'Colossus' gantry used by the Royal Air Force in handling Bristol-Ferranti 'Bloodhound' guided missile. (Anderston Clyde Engineers, Ltd.)



RIGHT
Loading a railway truck with a Rapier 4 Standard mobile crane. It has a lifting capacity of 8,000 lb at an outreach of 3 ft 10½ in or 3,600 lb at an outreach of 10 ft 4 in

BELOW
A Simon hydraulic platform which will be exhibited on the stand of the company's agents, Messrs. Ahlers Lindley, Lda.





LEFT
Matbro Series III '60' fork lift truck (Mathew Bros.) which will be shown by the company's agents, Rolim Commercial of Lisbon

BELOW
Priestman excavator

Ransome & Marles Bearing Co., Ltd., are showing their standard range of ball and roller bearings.

W. & T. Avery, Ltd. Amongst the products which this firm are exhibiting is a constant-rate feed scale designed to feed powdered or granular materials by weight, through a continuous blending process with consistent accuracy. Also to be shown is a package check-weigher, fully automatic, which rejects any package the weight of which falls outside a predetermined tolerance zone. The local representation for this firm is Avery Portuguesa, Lda., 66 Rua Braamcamp 70, Lisbon.

Messrs. E. Pinto Basto & Co., Ltd., Portuguese distributors for Priestman Brothers, Ltd., will be exhibiting a Tiger V-X Universal excavator at the above exhibition.

This machine has found great favour in Portugal and operates a range of ⅝ cu. yd. front end equipments. The machine exhibited will be a crowd shovel and will be equipped with 24-in crawler plates. With drag-shovel equipment the Tiger V-X trenches to 19 ft using a gooseneck boom and all-cast 'Precat' bucket.

Light controls, driver comfort, easy operation and ease of maintenance are features which have made this machine extremely popular in a large number of overseas markets.

Contributing to high output and reliability, the Priestman cross-roll bearing (patented) is an entirely new conception of excavator slewing ring which requires absolutely no adjustment or maintenance apart from occasional greasing.

THE INTERNATIONAL PLASTICS EXHIBITION 17—27 June, 1959

MORE THAN 250,000 sq. ft. of floor space will be occupied by exhibitors at the International Plastics Exhibition, Olympia, London, 17-27 June, 1959. Every aspect of plastics technology will be represented by more than 270 manufacturers and suppliers of materials, equipment and products. As in the previous exhibition in 1957 participation is international and thirteen countries will be represented. The event is organized by our associate journal *British Plastics*.

New Materials

Materials to be shown will include all the well-established thermoplastics and thermosettings with a wide variety of products made from them. Many of these materials will be in improved and more diversified grades, while among materials recently introduced in the U.K. and shown in quantity for the first time in this exhibition will be polypropylene, high-density polythene, and cellulose propionate. The display of polypropylene will be one of the highlights of this section of the exhibition and will be of particular interest as the commercial production in the U.K. of this material approaches. Two firms at least will be displaying polypropylene materials. Rigid p.v.c. is assuming greater prominence in the vinyl class, particularly for extrusion, and many profiles and pipe applications of this material will be displayed.

Vast Display of Machinery

One of the most impressive aspects of the exhibition will be the equipment section which will contain many advanced machines.

Developments in injection moulding equipment during the past two years have been directed in the main towards the more general use of pre-plasticizing equipment on both large and small machines and to the construction of large capacity equipment capable of injecting up to 200 oz of material. Initially the use of pre-plasticizing equipment on large injection machines was to reduce cycle times and from its success the principle has been adopted to an increasing extent on smaller machines. Examples of both large and small machines will be shown by manufacturers in the U.K. and from the Continent and many will incorporate the latest developments in pre-plasticizers, heating and control equipment.

New Developments in Equipment

In the extrusion field developments have been towards increased outputs with a consequent increase in power consumption requirements. Machines are neater and more compact and greater attention has been given to the problem of service and facility with which major components can be removed for service or replacement. A marked increase in the use of film packaging has highlighted the market for film plant and a number of leading manufacturers will show complete film installations.

The development of fully automatic compression moulding presses has continued and examples of equipment incorporating power loading and complete control of both cycle time and temperature will be seen. Of particular interest is the new preheater giving greatly improved cycle time. During the past two years considerable progress has been made in the matched die moulding process and glass-reinforced components are finding increasing use in many fields. Large platen presses having special characteristics and designed for the moulding of these materials will again be shown by British manufacturers. Progress in dough-moulding techniques are also anticipated.

Of the many exhibits of particular interest to readers of this journal are the following on the stand of BTR Industries, Ltd. 'Pluvicor' and 'Silvertown' fire-resistant p.v.c. conveyor belting for use underground. 'Pluvicor' p.v.c. conveyor belting for food processing and handling plant.

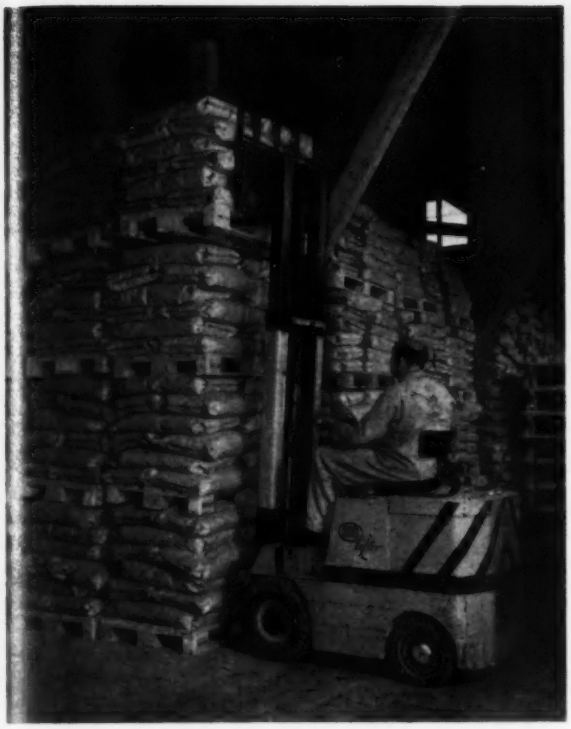
An extremely interesting exhibit will be a sample of specially constructed conveyor belting, embodying a unique 14-ply carcase of 100 per cent 'Terylene', designed for particularly arduous service.

SWISS MECHANICAL HANDLING SHOW

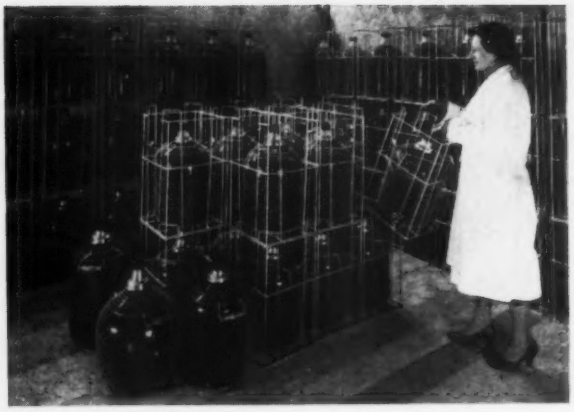
By V. Wolpert

THIS YEAR'S Swiss Industries Fair, Basle, which took place in April had a special section devoted to efficient goods handling and transport. Contrary to the previous annual Fairs, at which some Swiss manufacturers had shown their products for handling of goods, this year's Fair provided for the first time a comprehensive show of different methods of mechanical handling of goods inside factories and warehouses, different methods of transport, and a display of Swiss equipment, appliances and auxiliary implements used for these purposes.

The realization of the importance of efficient handling of goods had led to the establishing of the Swiss Research Society for Efficient Goods Handling. The members of this Society are industrial and trading firms who are interested in these problems, and the aims of this organization are to achieve a better co-ordination and highest rationaliza-

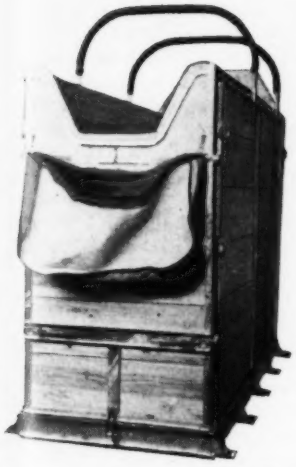


Fork truck being demonstrated at the Swiss Industrial Fair



Containers, wire-meshed for handling bottles

Several various types of gantries were displayed. This one is shown in use servicing aircraft



A large container used for handling horses by air

An example of the many types of pallets exhibited

tion in this field through the means of co-operation among those engaged in production, transport and trade activities.

The introduction of standard-palletization and the agreement with the Swiss Railways on a pool of wooden pallets were important steps in rationalization. The ISO standard size of wooden pallets (1,200 mm × 800 mm) with a load capacity of 1 ton, has been gradually adopted by a number of continental countries, including Switzerland, France, West Germany, Benelux countries, Italy, Austria and Sweden.

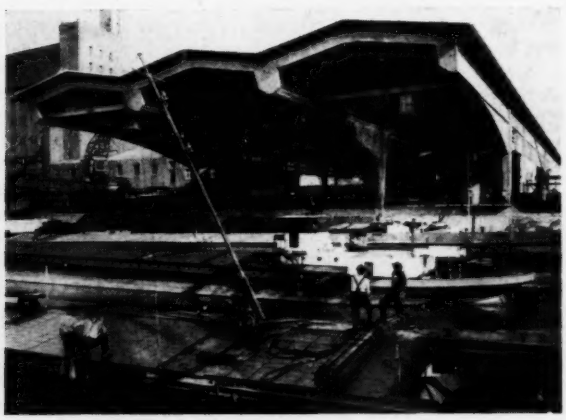
A large number of standard wooden pallets was on show at the Fair. The Swiss pool arrangement on wooden pallets (involving over 250,000 pallets) works in the following way: a firm when delivering their goods on standard pallets for railway transport receives from the Railways immediately the same amount of empty pallets in exchange for the pallets dispatched with their goods. At present this agreement is confined to Swiss internal traffic, but your correspondent understands that endeavours are being made to extend this scheme to other continental countries.

In case of special pallets, pallets from other materials, collapsible crates and other stacking racks on pallets, the Swiss Railways do not charge for their transport (they charge only for the weight of goods) and return them free of charge to the sender.

An outside demonstration showing the handling of bulk material from railway to road lorry

ABOVE
Crab crane 7 tons 17·63 m. boxframe design, speed: lifting 42 traversing speed of crab 44 and crane travel speed 150 m/min

BELOW
Three high-speed overhead cranes installed in the Basle harbour, 3 ton 14·9 m span



Specially developed trolley for handling large liquid containers

As the flat standard pallet provides a versatile unit for storage, internal and external transport, many firms exhibited attachable frames of profiled steel tubing and wire meshing, attachable walls, transport baskets—all standardized to the pallet dimensions.

Drawag A.G., Glattbrugg, had a wide range of products of this type on show. In addition this company exhibited 25-litre meshed-wire protected bottles which can be lately transported in special racks. These bottles, which are being supplied in the range between 3 and 25 litres (it is planned to start the production of 50-litre bottles shortly), are in great demand in Switzerland, and over 500,000 bottles were sold within the last 7 years (a few years ago a licensing agreement for the production in France was concluded).

The meshed wire is galvanized steel wire, while the racks are made of steel tubes and are galvanized after being made.

Swiss Industrial Company, Neuhausen Rhine Falls, exhibited a wide range of fork trucks. This firm has been manufacturing fork trucks for several years and has added now several new models, including the LEP 12 model, which has a carrying capacity of 1,200 kg (2,700 lb) at 400 mm, and has a hydraulic side attachment. The same manufacturer has introduced pedestrian-controlled trucks. These trucks have a high manœuvrability, and are driven by an electric battery. They are supplied in a range from 300 kg to 1,000 kg carrying capacity. All standard fork trucks built by this company are equipped with uniform swallowtail guides, so that any attachment (e.g. fork extension, ram attachment, crane attachment etc.) can be quickly interchanged or replaced by forks.

The production programme of Buhler Brothers, Uzwil, (London office: Buhler Brothers, Barnet) comprises conveying plants, including pneumatic and mechanical ship-discharging installations, and this company has supplied plant to a number of European and overseas ports.

A model of the Buhler fluid-lift conveying system for flour and powdery materials was exhibited at the Fair. This fluid-lift system represents a further development of pneumatic conveying, and because of the properly chosen mixing ratio of material and air the fluid-lift conveying allows the omission of separators and is a highly economical method of conveying flour and powdery materials.

Many large photos at the Basle Fair depicted various Buhler installations, including grain silos. The same company supplies plant and machinery for the oil-extracting industries, garbage-utilization plant, brewery and malting plants, and installations for other industries, and these

(*continued on page* 359)

installations include conveyors of required types and other mechanical handling equipment.

Konrad Peter, A.G., Liestal, are specialists in adjustable platforms which adjust the difference in level between loading platforms and railway cars or lorries.

The one- and two-column designed hydraulic models have a loading capacity of up to 50 tons, and the height of lift is up to 5 metres.

The mechanical lifting platforms are designed in one- two- and four-column models and have a height of lift up to 3 m.

Gebr. Frech, Sissach, exhibited ground equipment for aircraft servicing, including a mobile gangway ramp for jet planes. The ramp has a length of 9 m, width of 4 m and height of 6·5 m.

A collapsible box for air transport of race-horses and other equipment for air transport are supplied by this manufacturer for Switzerland and other markets.

Kempf & Co., A.G., Herisau, had an interesting exhibit, namely a hydraulic lifting table for loads up to 1 ton. The dimensions of the table are 140 cm × 100 cm, and the lifting height is 120 cm. It is designed on the 'scissors' principle, and folds flat to the height of 17 cm from the floor. It is operated by electric current, and has two push button controls, namely 'up' and 'down'.

The same manufacturer exhibited a fork lifter—model C 620—for vertical and horizontal movements.

Transima, Gesellschaft fuer Transport- und Industrie-maschinen, A.G., Zurich, exhibited the 'Ameise' fork truck built in Switzerland under licence from Messrs. Jungheinrich, Hamburg.

Jewsbury's Mechanical Handling, Ltd., are the sole concessionaires for United Kingdom for 'Ameise' Retrak.

The Swiss Railways had a big stand at the Fair, and large-scale photos demonstrated the rationalization of railway traffic, and the introduction of special types of wagons for transportation and unloading of different types of goods.

The Swiss Railway authorities are fully aware of competition from other types of transport but are confident that by modernizing their rolling stock and the efficiency of offered service they can hold their own.

Section of an elevator which is fitted with special-type cradles for conveying packages from floor to floor

Section of an aerial ropeway shown at Basle

In two halls of the Basle Fair two cranes built by Ludwig de Roll, Ltd., Berne, were in operation, namely one of 15 ton capacity and a span of 23·5 metres; the other one of new design but also of boxframe system has a capacity of 25 tons and a span of 39·1 m. This exhibitor had a very impressive stand at the Fair. In addition to cranes for industrial enterprises, this company supplies cranes for harbours.

It is only natural that in a country like Switzerland special skills and techniques were developed in building of funicular railways and aerial ropeways. In 1956 Lasso Ropeways, Ltd., Basle, supplied and erected an aerial ropeway in Tavanasa, Switzerland, near the source of the river Rhine. This plant has to feed a tunnel-construction site at 4,000 ft. above sea level throughout the year despite ice and high snow. The same company has started since the war to supply Lasso Cable Conveyors (which are designed for various purposes to serve in forestry, plantations, quarries and other plants for mechanical handling of bulky goods) to European and overseas countries. At the Swiss Industries Fair many large photos were showing some of these installations.

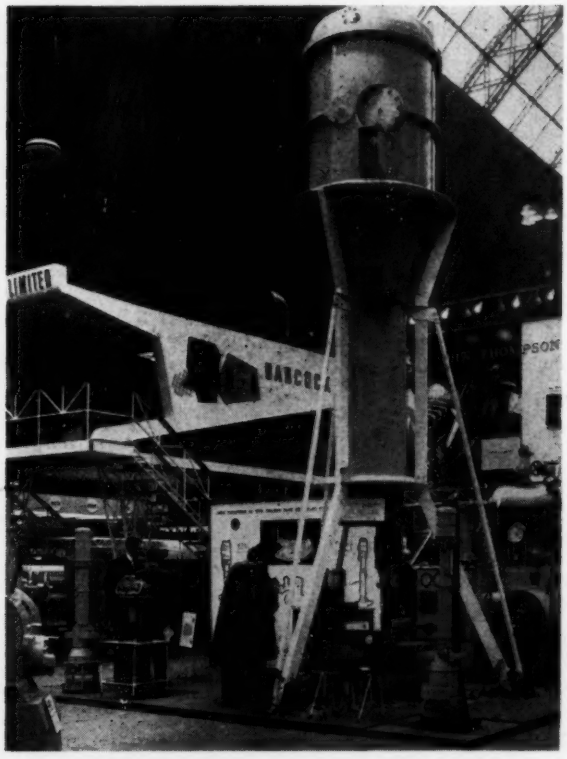
In addition, Lasso Ropeways, Ltd., has started recently to build for warehouses the Lasso-Elevator for vertical and horizontal transport of goods in warehouses. This type of elevator replaces successfully heavy lifts in cases when the goods are to be moved in small parcels of 20 lb to 1,000 lb not only on the same floor but also between the ground-floor and the first and second floors. These Elevators are built in different designs, including hand-operated and automatic models.

ENGINEERING, MARINE, WELDING AND NUCLEAR ENERGY EXHIBITION

Pumps and hydraulic transmission predominate among new developments in handling equipment seen at the Engineering, Marine, Welding and Nuclear Energy Exhibition at Olympia

FOR THE second time since its inception in 1906 the exhibition traditionally associated with the ship-building and heavy engineering industries of Great Britain has been opened by a representative of the country's nuclear energy interests. As chairman of John Thompson, Ltd., Sir Edward W. Thompson, M.A., J.P., heads a company that was among the original exhibitors and has developed and extended its activities to embrace all the three branches of engineering described in the present title of the Engineering, Marine, Welding and Nuclear Energy Exhibition. As honorary president of the exhibition Sir Edward spoke in his opening address for the British Engineers Association of which he is president, and for the six other sponsoring organizations, The British Acetylene Association, The British Electrical and Allied Manufacturers Association, The Institute of Welding, The Nuclear Energy Trade Associations Conference, The Society of Motor Manufacturers and Traders, Ltd. (Marine section), and the Electrical Welding Industry Committee of the British Electrical and Allied Manufacturers Association, Inc.

Fig. 1. *A section of the John Thompson, Ltd., stand*



Though ship-building was well represented at Olympia this year as an industry currently responsible for the construction of more than 22 per cent of the world's new tonnage, the traditional marine aspect was predominated by the influence of nuclear power production, which in 1966 is expected to achieve an output of 6,000 mW in the U.K. and 5,000 mW in the Euratom countries. Progress in the third branch of the triumvirate has been primarily influenced by this development as evidenced by the advance made in welding techniques to meet the exceptional performance demanded of reactor fuel-cans and pressure vessels.

These influences were seen in the mechanical handling field in the form of equipment for the remote handling of radioactive materials whether in the reactors themselves or in the form of radio-isotopes for industrial purposes. Physically predominant among them was the fuel-shute handling machine on the stand of John Thompson, where the machinery for outloading and unloading the fuel to and from the reactors at the Berkeley Nuclear Power Station was demonstrated by actual manufactured assemblies, scale models, and diagrams. The fuel-shute handling machine at Berkeley is 50 ft high, and the top 27 ft of it was installed on John Thompson's stand. Its function is to insert the charge shutes into the reactor pressure vessel through which uranium fuel elements are passed into the core of the reactor. A three-channel rotatable magazine and winding gear is installed in the pressure vessel itself. The 40-ft shute for the charge flux-scanning fixed absorber control rod and other devices are placed in the reactor to act as a guide between the charge floor and the nuclear power. The grab which picks them up or deposits them in place of a shielding plug in one of 60 possible positions is remotely operated at the top and the bottom of the machine. Two cables support the grab, the main cable by means of a torque differential gearbox always carries 10 times the loading of the secondary or emergency cable. The discriminator gearbox associated with the differential gearbox provides an accurate reading of the variable cable-stretch on the control panel, indicates the present position of the grab, and stops it at any predetermined depth.

The discriminator unit measures the depth of the grab inside the shute machine, and transmits it to the control panel on the shute machine, and controls the grab movement to the required depth. The unit measures the stretch of the main cable, and sends the information to a comparator, that gives an indication of the future life of the main cable. The accuracy called for in the manufacture of the gearboxes is of the order of that demanded for guided missil or gunnery control equipment.

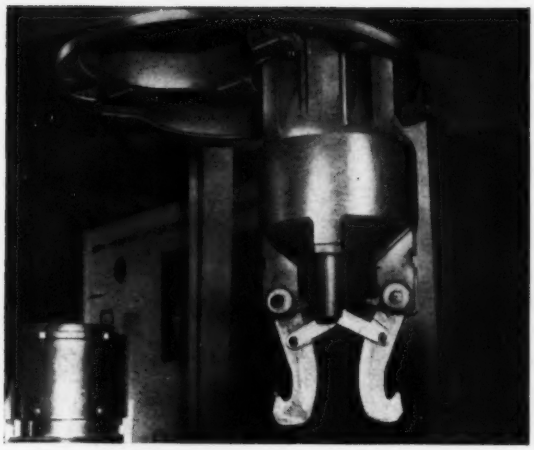


Fig. 2. One of the exhibits on the stand of John Thompson, Ltd.

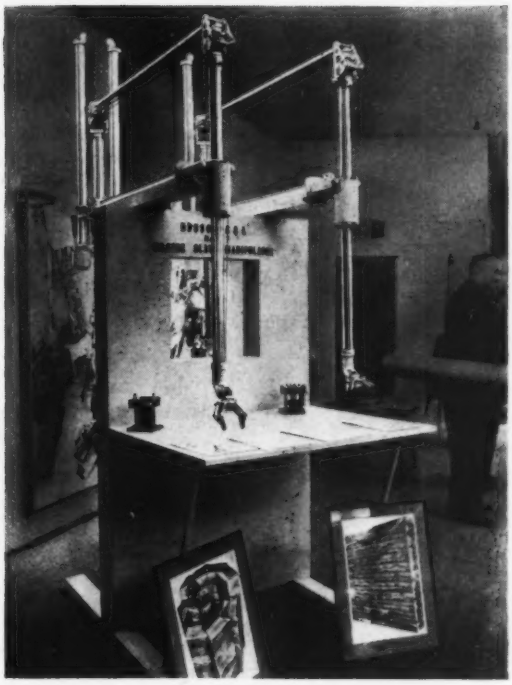


Fig. 4. Two of the examples of the manipulators shown by H. M. Hobson, Ltd.

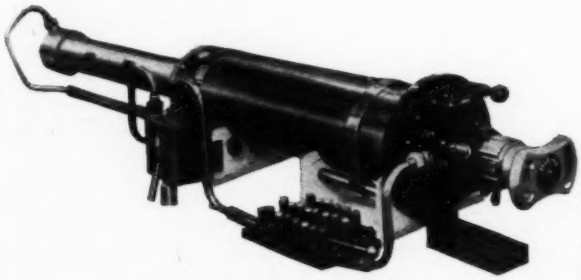


Fig. 3. An isotope loader model. H. M. Hobson, Ltd.

A model was shown of the charge-discharge machine. Of the two identical completely automatic machines used, one discharges and the other recharges 13 fuel elements from or into one of the 64 fuel element channels served by a charge shute. New fuel elements are then reloaded into the charge machine, while exhausted fuel elements from the discharge machine are returned for reprocessing. Other models demonstrated the construction of the control rod and actuator serving machine, approximately 50 ft high, which enables control rods and their actuators to be exchanged for servicing. The top portion can be indexed to line up one of four magazine channels and winding gear with a stand pipe in the charge face, and its four grabs remotely operated. The lower portion contains viewing equipment and manipulating tools, one of which remotely operated, has fingers which collect and move the control rod, and its suspensory cable in three planes, so as to separate or reconnect them.

Babcock & Wilcox showed for the first time in England buckles painting made during the construction of the 500 mW Hinkley Point Automatic Power Station, in which a 400-ton giant Goliath crane occupied the prominent position in the foreground. Responsibility for the design and construction of the Hinkley Point Station is undertaken by the consortium of English Electric, Babcock & Wilcox and Taylor & Woodrow in an automic power group.

Another impressive exhibit was the working model on the stand of Cooper Roller Bearings Co., Ltd., of a bearing ring of 8 ft 4 in outside dia. This angular contact ball-bearing of 90-in bore is one of two manufactured for John Thompson for use at Berkeley on reactor control and servicing, and will support a load of 90 tons. With a bearing run-out and flatness tolerance of 0·002 in it is so beautifully balanced that the exhibition model could be rotated by pulling a piece of sewing cotton attached to the top brace by cellotape. Balance is an essential characteristic of the master-slave manipulators with which radioactive materials are handled from the other side of a screen. H. M. Hobson, Ltd., showed a small manipulator that they are manufacturing in conjunction with the American company, Central Research Laboratories, Inc., of Minnesota who, in collaboration with the United States Automic Energy Commission, have designed and manufactured a wide range of these manipulators. The model demonstrated was the number seven, with a handling capacity of up to 10 lb/arm, and a weight of 48 lb/arm, which is suitable for use in hospitals, universities, and laboratories where the installation of a large manipulator is impractical. It comprises a pair of horizontal beams to which the tubular arms are attached on universal joint assemblies, the hands at the slave end being connected to those at the master ends by Bowden Cables. A system of counter weights ensures delicate balance of the arms, thus assisting accurate reproduction of the operator's manipulation and reducing the effort to a minimum. This counter-balancing combined with the maximum reduction of mass friction and lost motion enables the forces required to initiate and maintain uniform movement in any horizontal direction to be kept to less than 2 oz, while only 5 oz is required for movement in the vertical plane. The master ends are equipped with hands adjustable to handle a wide range of sizes, each provided with a locking grip as a standard fitment. At the slave ends general-purpose tongs are supplied as standard equipment, these being remotely interchangeable. Where

specialized or repetitive operations are required specially designed tongs can be supplied to suit the specific requirements, and these also will be remotely interchangeable. The main dimensions are, height, with arms raised assuming a 79¼-in high wall is built, 120 in, width, between centre line and master and slave arms, 48 in, height of master and slave ends when fully lowered, 34¾ in, height of master and slave ends fully extended, 64¾ in. On the same stand was a working model of the Hobson-AERE Honey-Comb Unit for loading and unloading radioactive isotopes into the core of a reactor. Up to 70 samples can be handled at one loading, and differing elements requiring varying radiation periods can be included. Accurate indexing is provided for loading and removal. The use of carbon-dioxide gas, which does not become radioactive during operations, is employed to effect the transfer of samples to and from the reactor, and an acceptance gauge is installed for the rejection of isotope cans that are not of serviceable standard. The honeycomb unit was developed to the specific requirements of the United Kingdom Atomic Energy Authority for use in the 'Dido' reactor. It weighs approximately 7½ cwt and has an overall length of 8 ft 7 in, and comprises an external control head, a shielding section to plug the aperture, and an inner radiation section of honeycomb construction. An aluminium thimble is clamped to form a concentric extension of smaller diameter on the inner end of the shield plug and projects through the graphite reflector and houses the honeycomb assembly. The unit is secured in the biological shield of the reactor to an adapter flange which forms part of the aperture liner. The control head is mounted centrally at the outer end of the shield plug, and consists essentially of a precision indexing mechanism for the control shaft.

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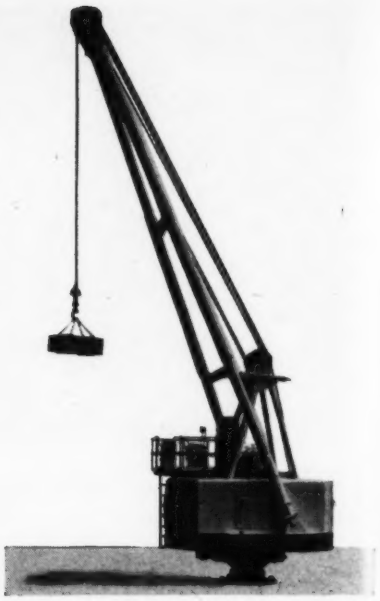


Fig. 7. A scale model of the latest Clarke, Chapman & Co., Ltd., level luffing crane

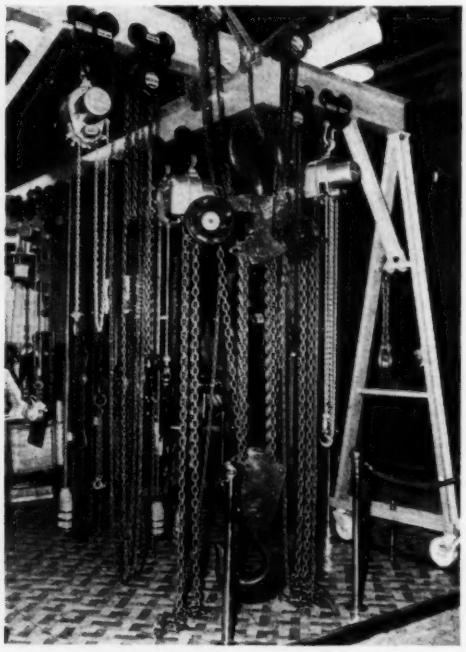


Fig. 5. (Above) Section of the exhibits shown on the stand of Felco Hoists, Ltd.

Fig. 6. (Below) Powell & Co. A section of their drum-handling equipment

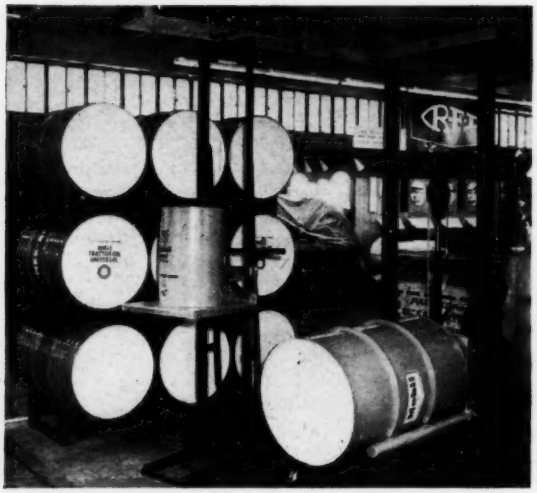


Fig. 8. Two of the trucks exhibited by Coventry Climax Engines, Ltd.

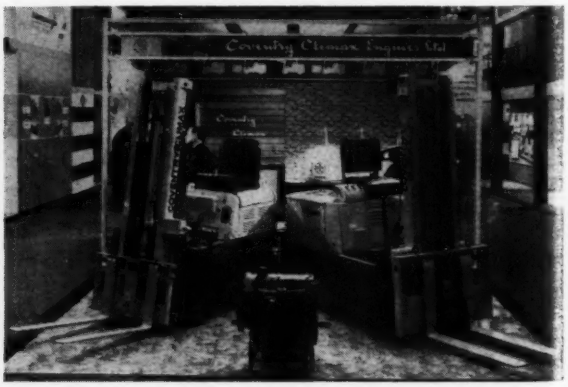
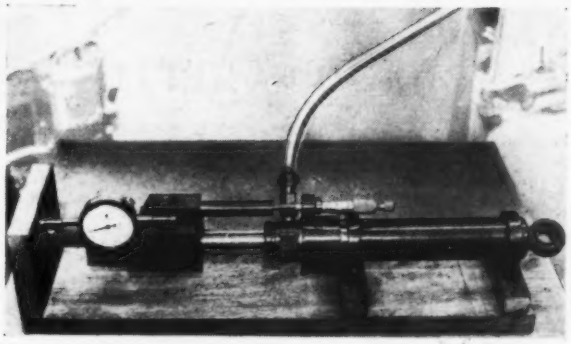


Fig. 11. *One of the exhibits shown by Hydraulics & Pneumatics, Ltd.* →



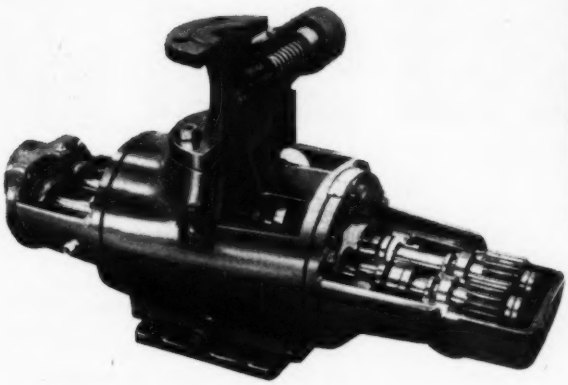


Fig. 9. *A sectionalized screw pump type W.3 exhibited by Hamworthy Engineering, Ltd.*

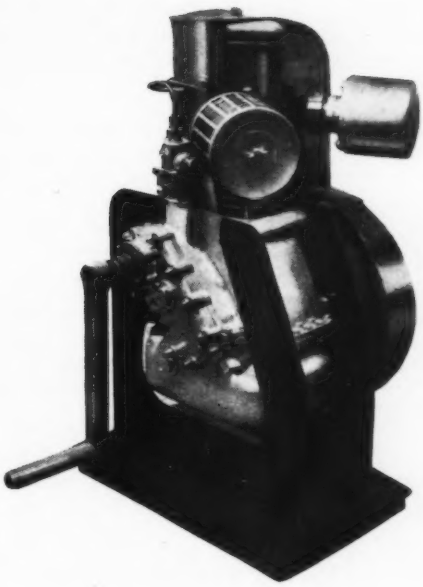


Fig. 10. *Interior of a degreaser shown by Fox Chemical-Engineering Works, Ltd.*

Fig. 12. *One of the electric diesel engines shown by S. E. Opperman, Ltd.*

It comprises a casting suitably bored and machined, to provide ports for the loading and ejection of the isotope cans, connections for the transport and gasses, and the indexing mechanism. This mechanism includes a hand-wheel of the spectacle type, which operates a control shaft and locking device and embodies a sleeve engraved with the numbers of the isotopes carriers in the honeycomb assembly. These numbers are brought into view consecutively through an inspection port in the control head by a combined longitudinal and rotational movement of the hand wheel, thus enabling the operator to locate any selected carrier and cell with absolute precision. A loading port in the control head serves also as an acceptance gauge which will reject other than serviceable standard isotope cans, thereby minimizing the possibility of jamming. Following irradiation, the active cans pass through an exit duct, which then causes them to tip and fall in first through a guide tube, and then into a shielded container.

The honeycomb assembly which houses the isotope cans during irradiation, comprises a column of 10 identical cylindrical carriers mounted in tandem on a common axis. Each carrier contains eight cells, seven of which will accommodate isotope cans, the remaining cell forms a hollow passage which can be selectively positioned to provide a transfer port for the transitive cans to successive carriers. The passage of cans through this transfer port was shown on the demonstration model by inspection windows provided in the outer housing. Housed in a container tube, and separated by bulk heads, each carrier can be rotated selectively from the control head by the control shaft, so that its transfer port, and that in each of the remaining carriers can be brought into line. Since each carrier can be rotated individually any cell in any carrier can be positioned to register with the transfer ports in the preceding carriers for loading and unloading. By virtue of a locking device the rotation of any carrier except the one selected is impossible, and co-ordination between the locking device and the control shaft ensures that only when the control shaft engages a particular carrier is it free to rotate. Visitors were able to see for themselves that operation, both for loading and unloading, was straightforward and safe. The fact that the operator has to extract the activated isotopes mechanically precludes any possibility of an irradiated container being accidentally ejected in error outside the biological shield.

(*To be continued*)

NEWS OF PERSONALITIES

A. G. Wilson

James D. Priestman

G.W. Grossmith

Lt.-Col. Eric Ward

Earl W. Doub

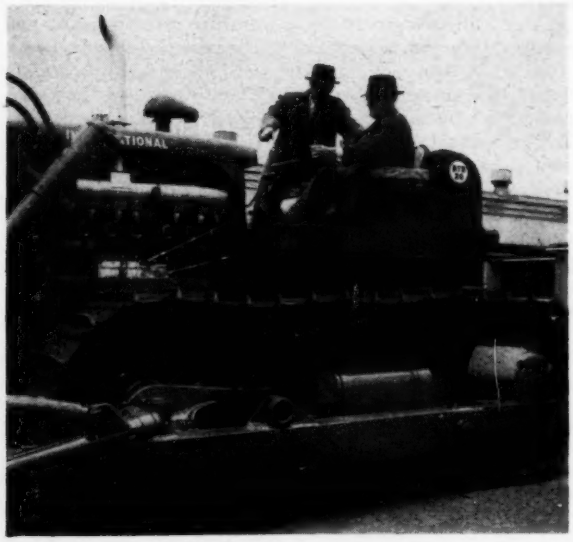
C. W. Allin, joint managing director, Redler Conveyors, Ltd., Stroud, has been elected to the Executive Committee of the Mechanical Handling Engineers Association in succession to the late T. A. Hammersley.

Frank W. Jenks, president of International Harvester Co., Chicago, recently made his first presidential tour of inspection of affiliated companies in Europe, reviewing manufacturing, engineering and sales organizations. Picture below shows Mr. Jenks driving a BTD-20 from the production line during his visit to the Doncaster works. With him is John Abell, Doncaster works manager.

Strachen & Henshaw, Ltd., mechanical handling and nuclear plant engineers of Bristol, announce that **G. W. Grossmith, M.I.Mech.E.,** has been appointed chairman, and **Lt.-Col. Eric Ward, T.D., A.M.I.Mech.E., A.M.I.Struct.E.,** managing director of the company.

James D. Priestman, sales and assistant managing director of Priestman Brothers, Ltd., Hull, left recently to undertake a series of visits to Sierra Leone, Ghana and Nigeria.

The purpose of this tour is to meet the company's distributors in these territories; to investigate the sales outlets with the Public Works, Drainage and Irrigation and other Government bodies; to see existing plant at work, and to be present at demonstrations of the Priestman 'Cub' V excavator with matched trailer, which have been specially arranged by the company's distributors in Nigeria.



Earl W. Doubet, formerly assistant sales manager of the Venezuelan, Pacific, Far Eastern Division of Caterpillar Tractor Co., Peoria, Illinois, U.S.A., arrived in Britain early this month to assume his appointment as sales manager with Caterpillar Tractor Co., Ltd., in Glasgow.

A. G. Wilson, managing director of Self-Changing Gears, Ltd., recently returned from Saudi Arabia, is shortly leaving on a world-wide sales promotion tour.

F. D. Murray has been appointed general manager of R. H. Corbett & Co., Ltd., of Burgess Hill, Sussex. Mr. Murray was formerly sales manager, Salisbury Precision Engineering Co., Ltd.

W. Morland Fox

J. S. Jeffrey has retired from the Board of Directors of W. J. Jenkins & Co., Ltd., of Retford, of which he has been successively deputy chairman and chairman for five years. Following the Annual General Meeting recently, he was presented with a 17th-century oil painting when reference was made to the esteem in which he was held by his colleagues and all members of the company.

W. Morland Fox has been elected to succeed him as chairman. Mr. Fox continues to be joint managing director with B. Pollard.

OBITUARY

We regret to report the death after a short illness of **John Neville Riley,** director responsible for the Mechanical Handling Division of Eccles (Birmingham), Ltd.

Mr. Riley was 32 years of age and had been actively associated with Eccles (Birmingham), Ltd., since 1947. He was responsible for the design and development of much of the present range of equipment produced by the Mechanical Handling Division of Eccles (Birmingham), Ltd., and was also responsible for chassis design and development for the Caravan Division of Eccles (Birmingham), Ltd.

Mr. Riley was the son of the present managing director, **W. J. Riley,** and was educated at St. Edward's School, Oxford. He was an Associate Member of the Institute of Materials Handling, Midland Division.

ABSTRACTS and REFERENCES

We regret that owing to extreme pressure on our space the above feature is held over until next month

REVIEW OF NEW EQUIPMENT

NEW MUIR-HILL DUMPER

A more powerful version of the Muir-Hill 10B 3-cu. yd. dumper is announced by E. Boydell & Co., Ltd., Old Trafford, Manchester. A high degree of driver comfort is an outstanding characteristic, and hydraulic brakes, hydraulically operated clutch, finger-light steering, weatherproof cab and hand controls located for easy gear changing and body tipping combine to benefit the operator and improve overall performance.

The machine is powered by a Fordson Power Major 3·61-litre 4-cylinder diesel engine which develops 52 b.h.p. at 1,600 r.p.m. and maximum torque of 171 lb/ft at 1,200 r.p.m. Power is transmitted through a dry plate clutch to a constant-mesh gearbox, providing six forward speeds of 2·07, 2·92, 3·73, 5·25, 7·32 and 13·16 m.p.h. and two reverse speeds of 2·80 and 5·03 m.p.h. Hydraulic transmission, incorporating torque converter and epicyclic gearbox, is an optional extra. Greater power is balanced by more robust construction of the chassis, axles, steering gear, metal trim and tipping gear.

A range of gravity and hydraulic tipping bodies, suitable for handling a variety of materials, is available, together with a selection of tyres for differing ground conditions. The Muir-Hill two-way drive, whereby the seat and steering column can be rotated to face the direction of travel, is standard.

FRONTLOADER WITH ALL-ROUND VISIBILITY

A novel feature of the new Merton Frontloader 59 is the location of the driver's cab at the extreme front, giving the driver 360 deg all-round visibility and a completely unobstructed view of the bucket and ground at his front. He can thus exercise complete control in digging to an accurate level and obtaining maximum loads, can manœuvre with great precision and approach vehicles or loading hoppers with complete accuracy. The cab has very large, toughened glass windows, the whole rear section slides backwards to give access from either side and a large ventilator is fitted.

All points requiring maintenance attention are immediately accessible, and for major repairs one man can, in five minutes, remove all necessary covers and exterior sheeting. The hydraulic pump can be removed without disturbing the radiator.

The hydraulic linkage gives a loading height under the lip of the tipped bucket of 10 ft 6 in or 12 ft under the hinge pin with a forward reach of 2 ft, achieved by rearward location of the lifting arm pivots. The standard bucket is of 1-cu.-yd. capacity and the payload 2,800 lb. Smaller or larger buckets are available. The bucket crowd angle is 45 deg and discharge angle at maximum height is 45 deg, permitting excellent discharge of sticky materials.

The hydraulic controls incorporate detents and are grouped for easier operation. When moved to the 'raise' position, the lever will remain there until, the operation completed, it automatically returns to the 'hold' position. The control handle is also retained in the 'lower' position whilst the bucket returns to ground level, leaving both hands free for steering and gear changing. In the 'lower' valve position the bucket is able to float and follow the contour of the ground.

The machine is powered by the new Fordson 4-cylinder engine, giving 54 b.h.p. at 1,800 r.p.m. The drive is transmitted by a 13-in Borg & Beck extra-heavy-duty clutch and transmission giving six forward and two reverse speeds up to 12·45 m.p.h. and 4·75 m.p.h. respectively.

Other equipments which can be fitted include a bulldozer blade and crane and fork-lift attachments. Also available is a Holman two-tool compressor unit which can be fitted beneath the rear canopy. Ample lockable space can be provided for pneumatic tools and hoses.

Manufacturers are the Merton Engineering Co., Ltd., Faggs Road, Feltham, Middlesex.

AIR BLEED VALVES FOR HYDRAULIC SYSTEMS

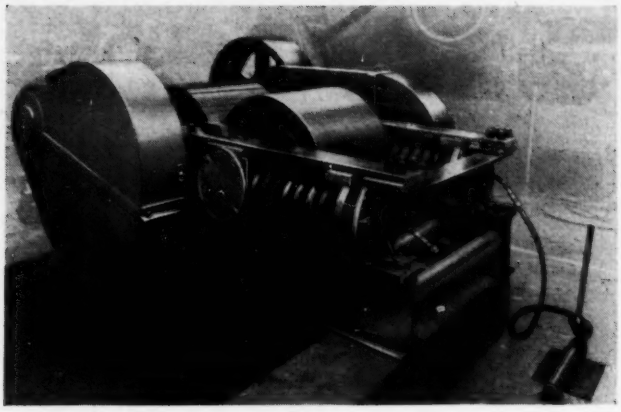
A new range of low-priced air bleed valves for hydraulic systems has been introduced by Hydraulic Components Co., 5 Manor Gardens, Scarborough. Known as Series VBI-60, these are designed to release at the highest points of the systems air entrained in hydraulic fluid, causing poor feed, cavitation, suction failure and noise. By affecting the bulk modulus of the fluid, pressure build-up time is increased and hydraulic stiffness reduced. In servo systems this tends to produce instability.

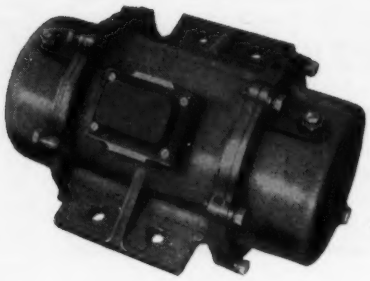
A hexagon head screw holds a ball on a seating to seal these valves. Models are available for welding direct to pipes, cylinders etc., or with connector ends screwed ¼, ⅜ and ½ in B.S.P.F. parallel external thread for use with joint washers. Other threads, including taper threads, can be supplied. Bleeding is carried out by loosening the hexagon head screw, allowing the ball to unseat and release the trapped air. As soon as fluid free from air bubbles flows from the hole in the valve body the screw is tightened, sealing the valve again.

For attachment by welding, valve bodies are machined from '20' carbon cold-drawn steel, conforming to B.S.970 EN3B. Those with threaded connector ends are machined from bright hexagon steel bar, conforming to B.S.970 ENIA,

Illustrating a Merton Frontloader 59 and the clear view the driver has from the front-mounted cab

The recently introduced Muir-Hill IOB 3-cu. yd. dumper





A Sinex rotary electric vibrator with four-bolt lug mounting

The new Parker Rollsizer roller bearing stone crusher with hand-operated hydraulic pump

are cadmium plated for corrosion resistance, the lengths of connector ends correspond to those specified in B.S. 2051, Part 3, Steel Pipe Fittings for Engineering Purposes, and joint washer facings provided with parallel threads are of ample size for use with standard joint washers and seals. Valve screws are cold forged with threads rolled on, heat treated to 45 ton/sq. in. minimum tensile strength, and cadmium plated for corrosion resistance. The sealing balls are of 12 per cent chrome, 1 per cent carbon martensitic hardened stainless steel, for combined properties of corrosion resistance and hardness.

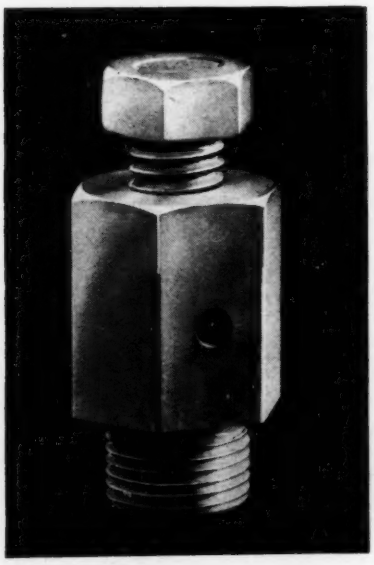
ROLLER-BEARING STONE CRUSHER

An outstanding feature of the new Rollsizer range of roller-bearing crushing rolls, made by Frederick Parker, Ltd., Viaduct Works, Catherine Street (Extension), Leicester, is a small hand-operated hydraulic pump for spring tension adjustment. The largest in the range, it has outputs of 32 to 75 tons an hour, and was introduced to meet the demand for stone crushed to minus $\frac{3}{4}$ in, but is adjustable to produce smaller or larger sizes.

It has a fabricated steel frame and hard-wearing rolls of manganese steel and is internally machined and taper-mounted for quick and accurate assembly. The roll shafts run in heavy-duty, self-aligning spherical roller bearings, labyrinth-sealed against dust, and can be lifted clear in a short time. Roll settings are obtained by inserting or removing small shims. The drive is by oil-bath-lubricated gear and pinion from countershaft to fixed shaft and then to floating shaft by finger gears. This ensures positive drive at all settings, reduces wear and gives smooth operation even when the rolls are temporarily misaligned by uneven feed through the rolls. Gears are of cast chrome molybdenum heat-treated steel, are totally enclosed and run in oil.

Roll shells for the crusher can be either plain or serrated on both rolls. By using a combination of different designs of shells its duty can be varied while two plain shells will give a large proportion of very fine aggregate but will need a reduced feed size. Maintenance cost of the rolls can be considerably reduced and their life greatly increased by using modern welding rebuilding techniques. Welding can be done without removing the roll shells from the machine and without any dismantling. Instructions on the rebuilding and hardfacing of crushing roll shells by welding are given in a booklet, TP/264, issued by the Parker Technical Publications Department, and units for grinding the surfaces of the rolls when fine crushing is needed are also available.

A $\frac{3}{8}$-in hydraulic system air bleed valve with threaded connector end introduced by the Hydraulic Components Co.



NEW ROTARY ELECTRIC VIBRATOR

A new design of rotary electric vibrator has been introduced by Sinex Engineering Co., Ltd., North Feltham Trading Estate, Feltham, Middlesex, for use as a power unit in feeders, conveyors, screens, knock-out beams and grids for foundries, compacting tables, shutter vibrators and in the discharge of material from storage hoppers. Many disadvantages of this kind of machine, such as short bearing life, overheating and cracked housings, have been eliminated. Exhaustive tests have shown that amplitude and centrifugal force need not be sacrificed to ensure longer life of bearings and windings.

Manufactured in four sizes, SVA, SVB, SVC and SVD, the machine is dust-proof, simple to install, and the design eliminates the usual need for constant maintenance. It can be provided with automatic timers for intermittent operation and be fitted with flameproof connections. It is more compact than previous models and consists essentially of a squirrel-cage motor carrying out-of-balance weights at both ends of the rotor shaft.

The four sizes provide centrifugal forces of 300, 500, 1,960 and 7,600 lb respectively, running at the standard synchronous speed of 3,000 r.p.m. Vibrators running at 1,500 r.p.m., for handling or compacting certain difficult materials or providing larger centrifugal effects, can be built to special order. Windings other than the standard 440-V, 3-phase can be supplied. Four-bolt lug mounting is employed, but the two smallest models can have an alternative pin fixing for use with shutter vibration for concrete placing and similar applications where a single power unit has to be transferred quickly from one item of equipment to another.

SELF-PROPELLED MOBILE WORKSHOP

Designed for maximum usefulness in maintenance, repair and overhead assembly, the Shop-Van is a self-propelled mobile workshop made by the Vanguard Engineering Co., 1908 E. 66th Street, Cleveland, Ohio. It is a low-priced battery-powered unit that will transport 2,000 lb of tools, materials and equipment, eliminating time-wasting trudging to and from the supply centre or stores. Heavily constructed of unitized, welded steel, it is supplied complete with telescopic working platform, battery, bench vice, pipe vice and large cabinet. One side of the cabinet contains 16 drawers, each with inner sliding tool tray, the other side consisting of two sliding door shelf compartments. Drill presses, bench grinders etc. can be mounted on the 34 × 68-in table top. The telescopic working platform, which is hand-winch operated, has a raised height of 10 ft and lowered height of 6 ft.

The propulsion unit is of the fifth wheel type with a speed of $2\frac{1}{2}$ m.p.h. and

(*continued on page* 367)

The battery electric Shop-Van self-propelled mobile workshop with telescopic working platform and bench and pipe vices

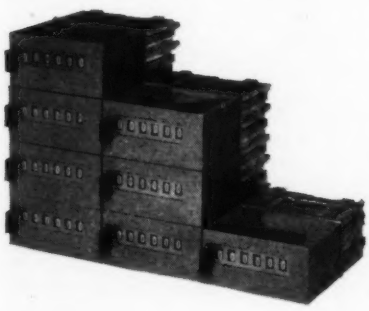
A mobile flight of stairs constructed from Dexion multi-purpose grids and slotted angle

excellent manœuvrability so that the Shop-Van can make a complete turn within its own diagonal length. There is a choice of steel, hard plastics or rubber-tyred wheels. Stand-up and sit-down rider models with speeds of 4-8 m.p.h. are also supplied. All models are available without the telescopic platform.

ELECTROMAGNETIC COUNTERS

Sole selling rights in Great Britain for Hengstler electromagnetic counters, types F43 and F43M2, have been obtained by Lancashire Dynamo Electronic Products, Ltd., Rugeley, Staffordshire. The counters are being incorporated in Lancashire Dynamo counting installation and are also available in preferred coil ratings on an ex-stock basis for use as component items for general industrial applications. These marketing arrangements apply only to the F43 and F43M2 counters; other Hengstler mechanical and slow-speed electro-mechanical counters will continue to be marketed in this country through Brian R. Morris & Co., Ltd.

An interlocking assembly of eight F43 Hengstler electromagnetic counters



Capable of counting at speeds up to 2,400 impulses per minute, these two units are basically similar in design. Both provide six-digit indication; the F43 incorporates manual reset and the F43M2 both manual and electrical reset. Both types are available in high-speed or low-speed versions and at a number of preferred D.C. operating voltages. Rectifier units for operating at certain preferred A.C. ratings will shortly be available.

Each counter comprises the counter itself and a socket box into which it is inserted, electrical connections being made by plug and socket at the rear. The box is a pressure die casting, mechanically interlocking with adjoining boxes on all four sides for large bank assembly. Incoming connections are made on the rear of the socket box.

DEXION MULTI-PURPOSE GRID

At the Dexion Building Exhibition, to be held at Stonebridge Park, Wembley, from May 26th to June 4th next, will be shown a new multi-purpose grid that can be quickly bolted together with fixing plates and standard Dexion nuts to suit almost any purpose where a grid-work or flooring is needed. It was designed by the Research and Development Section, Hemel Hempstead, of Dexion, Ltd., Maygrove Road, Kilburn, London, N.W.6. It can be used with Dexion slotted angle structures and is based on similar do-it-yourself principles.

The grid, which is cheaper than standard floor grids at present available, will be available in 9 in widths and in standard lengths of 4 ft 6 in and 6 ft. Non-standard lengths in multiples of 1½ in will be available in minimum quantities of 12. Fixing plates are sold in separate packs.

CATERPILLAR TRACTOR-SCRAPER COMBINATION

The Caterpillar Tractor Co., Ltd., have introduced a new No. 619 two-wheel rubber-tyred tractor and No. 442 scraper combination, designed to operate at high speeds, formerly possible only with 4-wheel hauling units. The tractor has a 225-h.p. turbo-charged diesel engine with adjustment-free fuel system dry-type air cleaner, special alloy valves, aluminium alloy pistons, chrome-plated piston rings and water-jacketed cylinder liners. A top speed of 30·2 m.p.h. has been made possible by a carefully engineered relationship of centres of gravity, wheelbase, turning points, weight distribution and machine harmonics.

Easy accessibility is a special feature. For example, the transmission, differential and cable control can be removed by one man in 30 min, the cable control alone in 10 min, the clutch in 30 min, without removal of the engine, and the engine itself in about 3 man-hours. The dash-board is hinged and can be swung to one

The new Caterpillar No. 619 tractor and No. 442 scraper combination

LEFT
A Coles Mudmaster mobile crane negotiating rough and muddy ground

side for ready access to the starting engine air compressor and hydraulic pump, and the left side of the engine can be exposed without dismantling any major component connected with the dashboard.

The new hydraulic steering system has a built-in safety device in that greater turning power is provided when coming out of, than when going into, a turn. This assures the operator enough power to turn out of any adverse ground condition, and the extra power provided when coming out of a turn also helps to overcome the inertia force of the loaded scraper which tends to keep a two-wheel tractor from returning to centre after a turn. During the complete turning arc, from dead centre to 90 deg right or left, the two hydraulic cylinders move in one direction only, providing smooth, constant power for turning. This eliminates loss of turning power when jacks must reverse at a point part way through the turning arc.

Other tractor features are a 16-in dry two-plate clutch, easily removable and equipped with an air booster, barrel type transmission, providing six forward and two reverse speeds, planetary final drive, with split type roller bearings for the planet gears, full-floating axles, individual drive wheel air brakes that can be operated independently, and the recently introduced Torsionflex seat.

The No. 442 Series B scraper is of 18 cu. yd. heaped capacity, the Lowbowl design providing quick, easy loading to full capacity. With draft frame of single unit construction to afford maximum strength, it is cable operated, with positive controlled dozer type ejection, apron opening of 5 ft 4 in, has adjustable scraper, axles, to level the bowl, and wide section tubeless tyres. Air-operated Syncro-Safe brakes are standard.

IMPROVED COLES SELF-PROPELLED CRANES

By the use of larger travel motors and generators and 4 × 4 wheel drive, the travelling performance and tractive effort of the Coles S510, S1110, S1210 and S1510 self-propelled diesel-electric cranes have been improved by Steels Engineering Products, Ltd., Crown Works, Sunderland. These improved features, available as optional extras, enable the Mudmaster range, as it is named, to move rapidly around operational sites and operate successfully regardless of prevailing ground conditions.

The maximum speed on level ground of the standard 6-ton S510 Diligent model is raised from 3 m.p.h. to 12 m.p.h., and the tractive effort from 3,700 lb to 7,800 lb. The speed of the 10-ton S1110 Matchless crane is increased from 4 m.p.h. to 10 m.p.h. and the tractive effort with 4 × 4 wheel drive from 6,700 lb to 29,000 lb and with 4 × 2 wheel drive to 10,000 lb. As the standard S1510 Dominant crane already has a maximum speed of 10 m.p.h., no modification is made to increase it. With four-wheel drive, however, the maximum tractive effort is increased from 10,000 lb to 29,000 lb and the machine can negotiate a 1 in 2 gradient instead of 1 in 3 possible with the standard model. An increase in speed of up to 6½ m.p.h. gives the 10-ton S1210 Aenas model a maximum speed of 10 m.p.h. The four-wheel drive gives a maximum tractive effort of 29,000 lb as compared with 6,500 lb of the standard model and makes it possible to climb a gradient of 1 in 2 instead of only 1 in 7.

TRADE NOTES

National Joint Committee on Materials Handling Lectures and Lecturers on Materials Handling Subjects

Materials handling problems arise in every branch of manufacturing, transport and warehousing and it is in the national interest that solutions to these problems should be found by a scientific and informed approach leading to higher labour and capital productivity. To this end the National Joint Committee on Materials Handling, a body on which are represented over 20 professional and kindred societies concerned with various aspects of the subject, feels that it may be able to assist secretaries of societies and other bodies drawing up their programmes for the 1959/60 sessions, by suggesting suitable subjects for lectures and possible lecturers. For further information write to the Secretary, National Joint Committee on Materials Handling, 69 Cannon Street, London, E.C.4. Telephone City 4444.

Spencer (Melksham), Ltd.

The above firm are setting up a new office at 34 Great North Road, Newcastle upon Tyne, 2. Telephone: Newcastle 26800.

The name of the company's representative there is Mr. N. A. Macdonald.

International Cargo Handling Co-ordination Association

The Central Office of I.C.H.C.A. is now at Hope House, Great Peter Street, London, S.W.1. The telephone number remains the same as hitherto, Abbey 2102.

New English Electric Sub-Office at Middlesbrough

A new sub-office of The English Electric Co. was opened recently at 14 Albert Road, Middlesbrough (telephone Middlesbrough 44346/7). Mr. A. R. Johnson, B.Sc., A.M.I.Mech.E., A.M.I.E.E., A.M.I.Prod.E., is in charge and is responsible to the manager of the English Electric branch office at Newcastle upon Tyne, Mr. W. D. M. Lywood, A.M.I.E.E.

Newman Open Newcastle Office

The Electric Motor Division of Newman Industries, Ltd., has opened an additional area office at 59 Grey Street, Newcastle upon Tyne, 1, telephone Newcastle 2-3970. The new area manager is Mr. R. Martindale. A stores, adjacent to the new office, will carry stocks of electric motors and the company states that these facilities will provide a more efficient service in the north-east of England.

(*continued on page* 369)

L. R. Stokes, Managing Director of Bowmaker (Plant), Ltd.

Artist's drawing of the proposed building

A typical hospital application for the King 'Bantam II' hand chain hoist

New Midlands Depot for Bowmaker (Plant), Ltd.

Recently a ceremony took place at Watling Street, Cannock, to start the rebuilding programme to be undertaken by Bowmaker (Plant), Ltd., distributors for Caterpillar tractors. The first earth was turned by a British-built Caterpillar D.8 by Councillor John Holston, J.P., chairman of Cannock Urban District Council. This new depot at Cannock will provide 85,000 sq. ft. of floor space and will have a frontage on the A.5 highway which runs from London to Holyhead. The gathering was addressed by Mr. L. R. Stokes, managing director of Bowmaker (Plant), Ltd., since 1954, who said that this large rebuilding programme would enable the company to offer customers a service which would enable 90 per cent of customer demands to be met immediately from the £300,000 worth of stock, which will be held. The accompanying illustration is an artist's drawing of the proposed building.

'Shorland' Range of Carriers

The following announcement is issued jointly by Short Brothers & Harland, Ltd., Belfast, and Conveyancer Fork Trucks, Ltd., Warrington.

Under an agreement recently concluded between the two companies, Conveyancer Fork Trucks, Ltd., are (as from May 1st last) appointed sole distributors at home and overseas of Straddle carriers manufactured by Shorts in Northern Ireland.

These vehicles, hitherto known as British Straddle Carriers, will in future be known as the 'Shorland' range of carriers.

Conveyancer Fork Trucks, who already handle a comprehensive range of mechanical handling equipment, will assume responsibility for all marketing and selling activities.

In addition to this arrangement, the two companies intend to collaborate in the design and further development of straddle carriers as well as other similar mechanical handling equipment.

A 'Shorland' carrier

A Hoist for the Disabled

The task of overworked hospital staffs is being lessened considerably to-day by the application of mechanical lifting devices for handling disabled patients. Equipment for this purpose now in production at Geo. W. King, Ltd., Stevenage, Herts, includes a 10-cwt capacity 'Bantam II' hand-operated chain block which can be used in conjunction with a pressed steel trolley running on a King No. 1 tubular door track. By the use of canvas slings attached to the hoist hook the patient may be lifted from bed or chair easily, comfortably and in complete safety.

The 'Bantam II' is a light compact triple gear unit requiring very small headroom. The gears are totally enclosed and the alloy steel load chain is carried on a hardened steel sprocket mounted on ball bearings. The brake is a self-adjusting screw-disc type, the sustaining power of which increases in proportion to the load being lifted.

Orders for Latin America

Aveling-Barford, Ltd., roadmaking and earthmoving machinery manufacturers of Grantham, Lincs, announce two further successes in their drive for business in the hard currency areas of Latin America.

(1) Cia Minera Santa Fe have ordered 10 13½-ton diesel 'shuttle' dumpers with spare parts for the rapidly growing iron ore mines they operate in Chile on behalf of the Canadian Foreign Ore Development, Ltd., and they have taken an option on 10 further machines. The dumpers will be working at some 5,000 ft above sea level and will all be despatched from Grantham within the next four weeks. Valued at £60,000, payable in U.S. dollars, this order is the manufacturer's first substantial postwar success in Chile, where economic conditions have previously been unfavourable, and it was obtained at the expense of established United States competition.

(2) The Secretaria de Obras Publicas, Mexico, has called for 15 6-ton three-wheeled diesel road rollers valued at approximately £30,000, to be despatched during the next six weeks. This is a repeat order that will bring the Secretaria's fleet of these machines to a total of 27 units, the first having been purchased about three years ago. The rollers are powered by Ruston & Hornsby 17-b.h.p.

Two Caterpillar No. 572 pipelayers, the first to be imported to this country, were recently delivered by Fred Myers, Ltd., the Caterpillar dealer, to Messrs. Constructors John Brown, Ltd. Here, Mr. Derek Bowers, the sales manager of Fred Myers' Earthmoving Division, is seen handing over the machines, at Myers' Brentwood depot, to Mr. A. Scott, of Constructors John Brown, Ltd.

Working in the timber yard at Benick Dock, King's Lynn, is this Hyster fork lift truck fitted with a Perkins P3(I) industrial-type diesel engine, capable of developing 41 b.h.p. at 2,400 r.p.m. The fork lift truck is owned by J. T. Stanton & Co., Ltd., King's Lynn

diesel engine and feature the Aveling-Barford patent pressure balancing device that permits them to undertake both compaction work and the surface finishing operations that are generally a two-wheeled roller prerogative.

Representatives in Yorkshire

Varatio-Strateline Gears, Ltd., of Aberdeen Avenue, Slough, Bucks, manufacturers of the Varatio variable speed gearbox and the Strateline speed reducer, announce that they have appointed Messrs. Wm. Don, Ltd., of Crown Works, Crown Point Bridge, Leeds, 9, telephone Leeds 33781, as their representatives for the county of Yorkshire.

New Branch

Over the past five years Ransome & Marles Bearing Co. have steadily enlarging their premises to meet the growing requirements of their customers. In addition to extensive factory rebuilding, no less than five area offices have been moved to new and larger premises. Entirely new branch offices have also been opened in Dundee, Liverpool and Cardiff. The latest branch is in Southampton where large stocks of ball and roller bearings are held, as at all area offices. G. D. Ball is manager of this new branch which is at 42 London Road, Southampton, telephone 28871.

Battery Companies Merger

From April 1st, the trading activities of The Alton Battery Co., Ltd., have been taken over by Pritchett & Gold and E.P.S. Co., Ltd., Dagenite Works, Dagenham Dock, Essex, who have been manufacturing on behalf of The Alton Battery Co. since early 1958.

Power Station Coal Handling Plant

The Central Electricity Generating Board have placed with Birtley Engineering, Ltd., Birtley, County Durham, a contract worth over £300,000 for the provision of the complete coal handling, storing and reclaiming plant for the new West Thurrock Power Station in Essex.

The picture shows the display of Rendale Conveyors, Ltd., and their subsidiary companies at the Birmingham Engineering Centre. Their display includes a section of gravity roller conveyors, underground and surface sectional belt conveyor for handling bulk materials and part of an overhead MonoRail chain conveyor

JULY

The above issue will contain :—

Report of the Institute of Materials Handling International Conference

Report of the Hanover Fair

Cooling Pitch on Conveyors (held over from June issue)

and regular features

PUBLICATIONS RECEIVED

G. Hunter (London), Ltd.
A general handling catalogue has been issued by the above company, of 80 Fenchurch Street, London, E.C.3, covering cranes, hoists, lifting tackle, jacks, conveyors, stackers, fork trucks, pallets and stillages. There are sections on modernization of despatch bays, and instructions on designing your own gravity roller conveyor.

Allen West & Co., Ltd.
The above company, of Brighton, 7, have published a leaflet describing their recently developed master controller.

Don Valley Engineering Co., Ltd.
An illustrated catalogue describing Don Valley 'Westfal' resonance screens has been issued by the above firm of Doncaster.

Ransome & Marles Bearing Co., Ltd.
Two comprehensive catalogues, Nos. 37 and 43, describing the correct application of ball and roller bearings, are available from this company at Newark-on-Trent.

Crofts (Engineers), Ltd.
These manufacturers have recently issued their latest publications regarding gears, conveyor pulleys, magnetic clutches and brakes, couplings, geared motors and reduction gears, emergency slipping devices and PowerGrip timing belts. These are

(*continued on page* 371)

obtainable upon application to this company at Bradford, 3.

Electronic Switchgear (London), Ltd.
A leaflet describing a recently developed range of electrolytic conductivity recording and indicating instruments has been published by the above manufacturers, of Works Road, Letchworth, Herts.

Harvester Round
No. 11, Volume 2, of the above magazine issued by the International Harvester Co., of Harvester House, 259 City Road, London, E.C.1, gives news of the company's recent activities.

A Steel Foundry Service
In their new 28-page booklet, The North British Steel Foundry, Ltd., of Bathgate, Scotland, have described the way in which their foundry is equipped to provide a steel foundry service. Amongst other things discussed in this booklet are the controls over processes, materials and production that are applied; the machining of castings, their conjunction into part-assemblies, and their integration into fabricated assemblies. In addition, this booklet also contains a reference section regarding the mechanical properties, chemical test requirements and equivalent specifications for 31 steels, together with short descriptions of their individual properties and applications.

Accidents
An illustrated booklet has been published by Her Majesty's Stationery Office on the cause and prevention of industrial accidents. Amongst other chapters are those on stacking and storage, cranes hoists and lifts and a general review of electrical accidents.

Sperry Gyroscope Co., Ltd.
Three leaflets issued by this company, of Great West Road, Brentford, Middlesex, describe their Servo valve drive amplifier, electro-hydraulic Servo valve and Micron filter unit.

Overhead Cranes
The new crane catalogue of The Clayton Crane & Hoist Co., Ltd., of Irwell Chambers East, Union Street, Liverpool, 3, is now available upon request.

Powell & Co.
A new 8-page catalogue DBC4 covering the range of 'Drum Master' handling equipment has been published by the above company, of Burry Port, Carms.

RECENT PATENTS

The following are brief extracts of recent United Kingdom patents which we believe will interest our readers. For full details the original patent specifications should be consulted at, or bought (3s. 6d. each) from, The Patents Office, Southampton Buildings, Chancery Lane, London, W.C.2.

GRANULE HANDLER
Goodwin, Barsley & Co., Ltd., of Leicester. —U.K. 788067—reissued and amended.

Stone, sand and granular materials, such as grain and sugar handled at twice normal rate by jig feed from a hopper to a reciprocating tray open at both ends.

LAMP CARRIER
Sylvania Electric Products Inc., of Salem, Mass. —U.K. 807473.

Lamp support with one-way releaseable clutch.

WAGON ELEVATOR
Simon Carves, Ltd., of Stockport.—U.K. 807474.

Cheap and simple rail-wagon elevator employing inclined beam sections, pivoted, and with part acting as a brake.

DUST CONVEYOR
W. Hermanns, of Germany.—U.K. 807489.

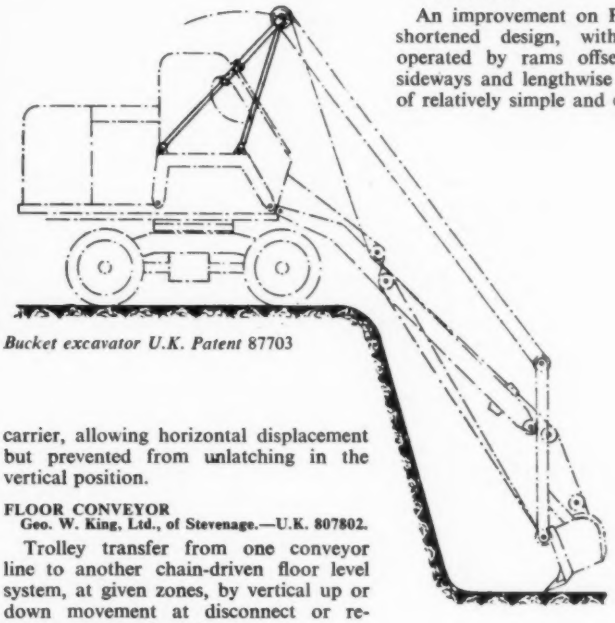
Pneumatic conveyor for dust with permeable inner wall inside a pipe from which it is supported by spacer fins.

BUCKET EXCAVATOR
Orenstein Koppel und Lubeder Maschinenbau A.G. of Berlin.—U.K. 807703.

Single-bucket device for use as a shovel, crane, grab, or drag, with a simple attachment for easy modification as required.

FREIGHT CARRIER
Clark Equipment Co., of Michigan.—U.K. 807743.

Latch design for detachable freight carrier, allowing horizontal displacement but prevented from unlatching in the vertical position.



Bucket excavator U.K. Patent 87703

FLOOR CONVEYOR
Geo. W. King, Ltd., of Stevenage.—U.K. 807802.

Trolley transfer from one conveyor line to another chain-driven floor level system, at given zones, by vertical up or down movement at disconnect or reconnect appropriate drives.

TOFFEE PRODUCTION
George W. Horner & Co., Ltd., of Chester-le-Street.—U.K. 807858.

Continuous strip production of nice surface appearance on a water-cooled endless belt, with a similar one above.

CHEESE SLABBING
Swift & Co., of Chicago.—U.K. 807881.

Cheese is moulded into slabs whilst plastic, in conveyorized teflon holders, and then interleaved with separating sheets, thus avoiding waste or human contact and need to clean conveyor, as well as giving a uniform product appearance.

LOADER CONVEYOR
J. E. Kennett, of Suffolk.—U.K. 807892.

Pick up and lift unit with parallel arms to pick up pallets or containers and can be attached to fork lift trucks or stackers and act as an inverter of bins if required.

LIFT TRUCK
Yale & Towne Manufacturing Co., of New York. —U.K. 807940.

An improvement on Patent 630168 of shortened design, with two uprights operated by rams offset and mounted sideways and lengthwise respectively, yet of relatively simple and cheap type.

LOAD LIFTER
A. Benz., of Zurich.—U.K. 807947.

A sack lifter, interconnected with load and porter platforms, which move under spring control, using a rope and chain pulley.

BREAD OVEN
Oven Kaovenbouw Voorkeen H.P. den Boer N.V., of Holland.—U.K. 807949.

Conveyorized dough trays are subject to steam treatment at start of baking oven, with injection above and exhaust below, to prevent surface fissuring.

DIGGING BUCKETS
S. A. O. Bodin, of Sweden.—U.K. 807950.

A bucket for excavating blasted rock, sand, gravel, etc., of given U-shape, but open at the sides to avoid resistance of excavation channel wall or jutting rocks.

TUB PUSHER
W. H. Barker & Son (Engineers), Ltd., of Stoke.—U.K.808003.

Improvement on Patent 740824 for compact mine-car pusher which allows traverse to move while the pusher is extended on its wheeled frame.

WHEELBARROW
Joseph Sankey & Son, Ltd., of Bilston.—U.K. 808004.

Metal tubular chassis frame with bolted body and telescopic locking handle.

PRESS TRANSFER
Sheweld Corporation, of Ohio.—U.K. 808011.

A simple device incorporating a reciprocating ram, which can be transferred from one machine to another.

SHOVEL EXCAVATOR
L. Gergen, of Saar.—U.K. 808018.

Jib and shovel rams have parallelogram linkage enabling them to clear flat surfaces and be used for shale excavation.

ROAD SWEEPER
Deighton Patent Flue & Tube Co., Ltd., of Leeds.—U.K. 808026.

Of smaller size than usual, but with suction filter to collect debris swept up.

GRANULE CONVEYOR
Fuller Co., of Delaware.—U.K. 808098.

Dense-type pressure unloader from bins, etc., for vehicles with low or high clearance—and can serve several at a time.

SHIPS' HATCHES
A. Wigeland, of Oslo.—U.K. 808110.

Hydraulically elevated sliding steel covers with wheels, guide rails and packings.

CHAIN DRIVE
Gordon Johnson Equipment Co., of Kansas City.—U.K. 808111.

Device enabling a conveyor to travel at a constant linear speed without bind, chatter or slip.

LINK BELTS
H. Knaut & U. Von Kritter, of Germany.—U.K. 808131.

A flat link traction chain with rollers on the plates and room for constraint guides for curved movement, giving a zig-zag support even if a side breaks.

STEEL PLATE BAND
Untertage Maschinenbau G.m.b.H., of Germany.—U.K. 808175.

Device for use on curved routes, with coupling to a central chain and flanged rollers with special track guide for curves.

BELT ROLLERS
B.T.R. Industries, Ltd., of London.—U.K. 808177.

Idler or drive-roller design for coal conveyors to resist load impact using resilient shell support.

PNEUMATIC CONVEYOR
Air Reduction Co., Inc., of New York.—U.K. 808179.

Means of transporting solids from hopper by using gas injection to give a dense fluid-like flow along a conveyor or into the bottom of a liquid-metal furnace.

DUMPER
Liner Concrete Machinery Co., Ltd., of Gateshead.—U.K.808216.

A self-propelled dumper with loading position of skip under a concrete mixer, intermediate between full-load and dump ones—using a cross-bar system carried by swinging links.

FURNACE CONVEYOR
T. Teisen, of Birmingham.—U.K.808233.

An overhead hook suspension arrangement, through a slot closed by stud plates and slightly pressurized with air to prevent loss of furnace temperature by gas exit—and also to aid cooling conveyor parts.

GRANULE CONVEYOR
F. W. R. Van den Baumen, of Holland.—U.K. 808332.

Peas, granules, etc., as a thin layer on a pneumatic or hydraulic conveyor can easily be picked up using partitions to form ducts at the exit end to reduce the fan power needed to create vacuum of sufficient lifting power.

FURNACE CONVEYOR
British Furnaces, Ltd., of Chesterfield.—U.K. 808334.

An oscillating conveyor design with atmosphere gases using a seal between the wall and conveyor, and having radiant gas burners.

PNEUMATIC UNLOADER
Polysius G.m.b.H., of Westfalia.—U.K.808340.

Air is introduced via a hollow motor drive-shaft into a porous disc casing.

COLLAPSIBLE CRATES
Aktiebolaget Berglofs Verkstader, of Sweden.—U.K.808464.

A design of collapsible crate container, which stacks by fork lift truck, whether folded or loaded.

NEWSPAPER CONVEYOR
W. Reist, of Zurich.—U.K.808584.

Conveyor is simpler and longer than the usual device employing a chain slightly displaced from the centre.

AUTOMATIC HANDLER
George Fischer A.G., of Schaffhausen.—U.K 808585.

A series of conveyors for adding and removing weights to casting moulds set on a third endless belt. The auxiliary conveyors carry the weights towards and away from the main line, at an angle, so as to leave the position above the mould largely free of overhead conveyors.

TIMBER DEBARKER
J. E. & W. B. Cundey, of Derbyshire.—U.K. 808588.

A debarker or processor for similar cylinders, somewhat as per Patent 778477, but which can deal with various diameters of timber by varying the relative position of the cutter disc and feed wheel or roller, using a pivoted shaft movement.

CONVEYOR LUBRICATION
Geo. J. Meyer Manufacturing Co., of Wisconsin.—U.K.808590.

A bottle conveyor drive system with automatic lubrication using rotating lubricant wheels to keep sprockets oiled.

CONVEYOR DRIVE
Geo. J. Meyer Manufacturing Co., of Wisconsin.—U.K.808590.

A case unloader which can automatically deal with bottles, even when their position varies, e.g. with different case depths—using chain-driven sprockets.

SWEET WRAPPER
R. Turner, of Leeds.—U.K.808881.

Toffees are automatically wrapped with an end twist, avoiding step-by-step disc rotation processes, and at increased speeds. Disc feed is used with pockets synchronously emptied by a plunger ejector towards twisting jaws, when covered with wrapper.

FIBRE BLENDING
Tweedcales & Smalley, Ltd., of Rochdale.—U.K.808882.

Fibres are fed in a lap or layer with automatic weighing to adjust the feed rate responsively, to give a desired quantity per unit length of conveyor, for superposition before opening out.

AUTOMATIC WASHING
Ajem Laboratories Inc., of Michigan.—U.K. 808885.

High-pressure conveyorized washing, draining and hot-air drying of auto parts—e.g. engine components, which is complete—using consecutive operation at a series of stations, including rotation, which operates at a high speed.

WOOD CHIP CONVEYORS
Ratgel Paper Corporation, of New York.—U.K. 808994.

Wood chip suspensions are regulated and controlled for solids content by volumetrically metering via a drained conveyor and recirculating the liquid with addition if required.